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# THE LARYNGOSCOPE.

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## THE MANAGEMENT OF DEAFNESS.\*

KENNETH M. DAY, M.D.,  
Pittsburgh, Pa.

Deafness, in greater or lesser degree, is one of the most common afflictions of the human body at some time during life. Until the past generation it was one of the most neglected of human ailments. We can be justly proud of the progress made in this field of medicine in recent years though there is still a long way to go.

Congenital hearing defects should occur more rarely with correction of Rh incompatibility and with better control and prevention of such diseases as syphilis and German measles in pregnant women.

Toxic damage of the cochlea or acoustic nerve as a sequela of the acute exanthemata is also on the decrease due to effective prevention and efficient management of the primary disease. We no longer see the ravaging effects of diphtheria and typhoid fever because the primary diseases have been nearly eradicated. Toxic nerve deafness still occurs in some cases following severe attacks of measles, scarlet fever, mumps and whooping cough though these also are on the decline. The acoustic nerve is sensitive to certain drugs such as quinine,

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streptomycin and occasionally the salicylates. With more careful and judicious usage of these drugs toxic nerve damage has been greatly reduced.

Deafness due to destructive local lesions from middle ear and mastoid infections has decreased tremendously in the past decade with the advent of biochemicals; in fact, acute mastoid infections now have become almost a rarity.

The prevalence of chronic suppurative otitis media with cholesteatoma has not been noticeably affected by use of the biochemicals which have little or no effect on this condition. Resort to radical surgery is needed just about as frequently now as it was a generation ago; however, there has been a definite improvement in surgical judgment and technique. Whereas, formerly, the classical radical mastoidectomy usually was performed for this condition, most otologists now modify the operation to suit the individual case rather than make the case fit the operation. They now preserve the eardrum and ossicles whenever feasible, thus preserving the hearing at a higher postoperative level. The basic cause of attic perforations with subsequent suppuration and the development of cholesteatoma, as yet, has not been satisfactorily explained and continued study of this condition is needed. It is my opinion that perforations of Shrapnell's membrane occur most frequently as a complication or sequela of chronic secretory otitis media. During the past five years I have observed attic perforations occur in four cases of recurrent secretory otitis media in which the eardrums previously had been intact. These four cases developed secondary cholesteatomas, and two of them required surgical intervention. I also have seen perforations of Shrapnell's membrane occur and later close spontaneously if secondary infection did not occur. Open, dry perforations of Shrapnell's membrane with no history or evidence of infection are not rare and some of these cases subsequently develop otitic infections and cholesteatomas, the most common cause being the introduction of water into the meatus from swimming or syringing the ear.

Secretory otitis media or otitis media with effusion is a condition far more prevalent than is generally realized, being

especially common in children. I do not agree with some of my confreres that these so-called fluid ears are occurring more frequently in the past few years than formerly. I maintain that they have been present continuously and were not recognized by many otologists. This condition was considered of sufficient importance nearly a century ago to merit some 30 pages in Politzer's classic textbook. The paucity and mildness of the symptoms, the fact that the great majority of these patients are young children and the lack of careful examination and keen observation on the part of the otologist account for the failure to diagnose this condition more frequently. We now know that the great majority of these cases have an allergic basis and that treatment of the accompanying nasal allergy is often necessary in order to control this condition and to prevent recurrences. The failure to recognize and control secretory otitis media in children is responsible for many of the hearing defects discovered later in life. I believe many of these cases of allergic rhinitis and secretory otitis media would be prevented by proper feeding of young infants. The infant's head should be kept elevated at least 30 degrees from the horizontal when it is fed from a bottle, otherwise it cannot swallow without forcing fluids into the nasopharynx. The frequency of childhood allergies to milk and orange juice may well be due to this insult to the tissues of the nasopharynx.

One of the greatest otologic achievements of the present century has been the development and perfection of the fenestration operation for clinical otosclerosis. This operation already has restored practical hearing for speech to thousands of individuals who otherwise would have gone through life hopelessly hard of hearing. It should be remembered, however, that this operation is purely a mechanical procedure to by-pass the oval window which has become obstructed because of the fixation of the stapes by an overgrowth of bone. The operation will not restore any hearing loss due to nerve degeneration. The operation is definitely an elective procedure, since an individual who will hear well following the operation will also hear well with a hearing aid. Time alone

will tell how permanent is the hearing improvement obtained by this operation and whether or not secondary nerve degeneration continues at the same pace as in the unoperated ear. Reports of 10 and 20-year results will be most interesting. Conservative medical treatment of clinical otosclerosis has failed to prove of any value whatsoever up to the present time.

Deafness due to fluid changes and distention of the endolymphatic system occurs in Ménière's disease. Although the deafness simulates a true nerve deafness with poor bone conduction and uniform hearing loss throughout the scale, actual damage and degeneration of the nerve cells may not occur for years. There is increasing evidence that this is primarily a cochlear disturbance and that vestibular involvement and attacks of vertigo may be prevented by prompt and early treatment. The fluctuating degree of deafness with roaring tinnitus, distortion of sounds and hypersensitivity to loud noise makes the diagnosis relatively easy. The hearing loss is reversible in some cases if treated early with peripheral vasodilators or histamine hypodesensitization, although no specific treatment has yet been found to yield uniformly good results. The basic cause of this condition is probably an intrinsic allergy affecting the internal auditory artery and its branches.

Perceptive or nerve deafness due to vascular disorders is definitely on the increase. As the average span of life continues to lengthen, we will see more and more cases of high-tone nerve deafness due to gradual vascular degeneration and an inadequate blood supply to the cochlea. This deafness is irreversible and progressive, and local therapy is of no value. Cardiovascular regulation may retard the progress of the hearing loss.

Cases of traumatic nerve deafness due to explosives or to continuous or repeated exposure to excessive noise have increased tremendously in the past decade largely because of the recent world war. In our modern machine age there are many occupations in which the worker must labor in an environment of noise at a dangerously high level. There is a wide

variation in individual tolerance to excessive noise. It has been my observation that the hearing of an ear with a large and straight external auditory meatus seems much more susceptible to damage than one with a small, curved meatus. Industrial organizations are becoming more interested in this problem because of their possible liability to pay disability compensation for deafness. Some are now requiring audiograms of new employees so as to eliminate liability for deafness acquired prior to employment. Sound treatment of buildings and insulation of machinery help to lower the noise level. Ear defenders should be provided when a dangerous noise level is unavoidable. The general public is becoming more noise conscious and many complaints are being registered about unnecessary and excessive city noises. Unless some measures are taken to reduce the general noise level of our cities and towns, I predict that the acuity of hearing of the general public will gradually be lowered before many generations have passed.

One other type of deafness which is rarely recognized is functional or psychogenic deafness. Studies at the army rehabilitation centers during the past war revealed a surprising incidence of nearly 20 per cent of cases of functional deafness among the total cases of hearing disorders which they surveyed. Audiology clinics are now picking up from 4 to 5 per cent of the cases referred to them. An important finding is the fact that the majority of the cases of functional deafness have an underlying organic deafness of greater or lesser degree. The management of these cases is very unsatisfactory at present. They need psychiatric aid, but there are too few psychiatrists and many of them are indifferent or uninterested in this type of case. There seems to be little doubt but that many of the so-called miracle cures of deafness following the use of some pet remedy have been really the result of a functional alteration in these psychosomatic cases.

Only the very few of us who have had the experience of wearing carbon types of hearing aids with distorted amplification, loud friction noises and large, cumbersome batteries can fully appreciate the improvements which have been made

in the development and perfection of modern hearing aids. These are proving a great boon to nearly a million people who have defective hearing which has not been improved by medical or surgical therapy. I, personally, can hear better and understand more with my present hearing aid than I could 15 years ago, even though my hearing loss for speech has increased from a 50 db average to an 85 db average during the intervening years. Otologists should have a working knowledge of the characteristics of hearing aid amplification and should have an understanding of what hearing aids can and cannot accomplish. For people with a conductive or mixed form of deafness the present hearing aids perform very satisfactorily with uniform amplification throughout the scale. It is much more difficult, however, to provide a satisfactory hearing aid for cases of perceptive or nerve deafness, especially if there be a disproportionate loss of hearing for different parts of the scale. Hearing aids are unsatisfactory and, in some instances, of no value for cases with good hearing for the lower scale, but an abrupt, severe loss of hearing for tones above 1000 cycles. This is the type of hearing loss so commonly found in cases of traumatic deafness and in presbycusis. Fortunately, these people can converse readily with one or two persons in quiet surroundings. The louder the background noise the more difficult does it become to interpret individual voices. Amplification of sounds, including the background noise, does not help the power of interpretation. A small ear trumpet is often more helpful for this group of cases than an electric aid.

For the severely deafened and especially for young children with defective hearing much more help is needed than can be obtained from a hearing aid alone. This is where an audiology department or aural rehabilitation clinic renders valuable service. Speech reading and auditory training are of great help to the severely deafened for whom a hearing aid alone is insufficient to provide the ability to understand readily normal conversational speech. Another valuable service is the preschool training of young children and their parents. Formerly, the deafened or defective child frequently was

neglected until it reached the public school age and valuable years of training were lost. These clinics are of great help in analyzing hearing defects and in solving diagnostic problems such as the detection of functional or psychogenic deafness. Their busiest service is hearing aid evaluations and educational training in the proper usage of hearing aids. A well equipped audiology department is expensive and will not be self-supporting, but it provides a most important public service and merits serious consideration in the allotment of public funds and subsidies by foundations and universities.

What is the present situation regarding the clinical management of deafness? It is quite good insofar as reversible forms of deafness are concerned; however, the majority of hard-of-hearing patients who consult us have irreversible forms of deafness which are not amenable to treatment. We fail badly in our management of this large group. For some strange reason many doctors refuse to admit that they cannot improve the hearing of these patients by means of local treatments. Also many false diagnoses are made because of cursory examinations and insufficient study.

Cases of conductive deafness, without suppuration or obvious damage of the conductive apparatus, too frequently are classified as having "chronic, catarrhal otitis media" and are treated with repeated inflations, regardless of whether or not the hearing may improve. The term "chronic, catarrhal otitis media" is a trash pile diagnosis and should be eliminated from our medical terminology. Unless prompt improvement of hearing occurs following two or three inflations, this type of treatment is usually contraindicated. Reports of thickened, retracted and distorted eardrums are often erroneous and the eardrums merely show variations of the normal. Too many cases of otosclerosis are treated year after year with inflations and massage. A pneumatic ear speculum is rarely employed to determine whether or not the eardrums are mobile and the middle ears ventilated. If the patient complains of a lack of hearing improvement, the inflations may be continued anyway to prevent the hearing from getting worse, though irradiation and operative procedures may also be tried. Many



tonsils, teeth and nasal septa are sacrificed on general principles to keep the patient satisfied and hopeful of improved hearing.

Cases of mixed deafness and of perceptive or nerve deafness are subjected to a whole gamut of treatments depending on the imagination and ingenuity of the therapist. Irradiations, vitamins and shots in the arm are added to the basic office treatments of nasal sprays and inflations. In the past 30 years the following types of therapy have enjoyed varying degrees of popularity: Subaudible vibratory machines to stimulate the organ of hearing; massage and titilation of the Eustachian tube orifices; irradiation; thyroxine; prostigmine; Jacobsen's solution; various vitamin combinations, most recently large doses of vitamin A; another recent form of therapy is based on the finding of hypercholesterolemia and hyperpyruvemia. Some of these forms of treatment were based on apparently sound, scientific reasoning and were tried out by many of us before it became apparent that they were of little or no value. If vitamin deficiencies were so important in causing nerve types of deafness, it seems very strange that surveys of large groups of evacuees from Japanese concentration camps in the past war failed to show any greater incidence of auditory nerve defects than similar groups of healthy troops, even though the evacuees suffered from extreme malnutrition and avitaminosis. Is it a mere coincidence that new remedies for deafness so frequently reach the headlines of the public press? It should be noted that many specific remedies have been advocated for deafness in general without consideration of the actual type of deafness or its cause. People with irreversible hearing defects can be counted by the million, most of them unwilling to accept the fact that their deafness cannot be cured and eager to try any new form of therapy purported to improve their hearing. They afford a lucrative source of income to unscrupulous therapists.

Why do these various types of treatment attain such popularity and why do we read so many reports of improved hearing following these treatments? The answer lies in the curious psychology of the hard of hearing.



It is a natural reaction for a hard-of-hearing person to have a sense of inadequacy and abnormality and to develop a severe inferiority complex when he has difficulty in conversing with his normal fellow men. In the race for survival of the fittest and in the competition to earn a livelihood, he feels definitely handicapped. The so-called selfishness of the deaf is the result of his failure to make an effort to overcome this handicap. Since he cannot hear well or readily understand what is said to him, he stops listening. Lack of attention and failure to listen make him seem much deafer than he really is. Hearing tests and audiograms are inaccurate since they are subjective tests. If he does not listen attentively he will naturally make a poor score. A hearing aid is repugnant to him as it advertises his infirmity. He wants a miracle, not crutches. If he consults an otologist and is told that his hearing cannot be improved and that he should try a hearing aid he becomes resentful and indignant. He is now ripe for plucking by any therapist who will tell him that his deafness can be cured or helped by treatments. The initial effect of these treatments is often an apparently marked improvement of hearing, noticeable not only to the individual but also to his friends and associates. Audiograms also will show improved scores. This improvement, however, may be purely illusory. With the hope and expectation of recovering his hearing loss, he becomes alert and attentive. He starts to listen again, which accounts for the apparently improved hearing. When, however, further improvement fails to occur, he soon becomes despondent and ceases to listen, whereupon the initial improvement is lost. The fear of further hearing loss and especially of total deafness may influence him to continue treatments even though he may subconsciously know that he is not being helped by them.

I occupy an almost unique position, since I am a severely deafened otologist. I wasted from five to 10 of what should have been the best years of my life as a selfish, depressed and self-pitying young man. I experienced the wild hopes and bitter disillusionments of futile treatments for my deafness. I not only was harming myself, but I also became a burden to

my family and a nuisance to my friends. I was like an ostrich with my head in the sand trying to conceal something which everyone already knew. It was not until I finally accepted my deafness as an unalterable fact and acquired the determination to overcome my handicap that I really began to enjoy life again. I learned to listen not only with my ears but also with my eyes and my brain. Today this is called speech reading and auditory training. I learned to use a hearing aid effectively, though I admit that the early models were very unpleasant with their distorted amplification. One of my most difficult tasks was the re-education of my own speech. With both ears plugged by ear receivers I found it very difficult to modulate my own voice. Even at present I am liable to shout when excited or mumble inaudibly when embarrassed. From my own experience I have learned that the handicap of deafness is about 90 per cent imaginary. When we cease waiting for miracles and are willing to accept crutches we soon discover that the crutches need not be at all burdensome.

It has been only during the past 10 years that I have fully appreciated what a tremendous asset my deafness has been to me in the practice of otology. There is a feeling of comradeship and understanding between a hard-of-hearing patient and his hard-of-hearing physician which could not occur if the physician's hearing were normal. Patients will accept advice and opinions from me which I know they would not accept from a physician with normal hearing.

The otologist has a definite obligation to his hard-of-hearing patients. If medical and surgical therapy are ineffective in improving the hearing, psychologic therapy is still available and badly needed. Fifteen to 30 minutes spent in a frank discussion of his problems will often give the patient greater help than months or years of futile treatments.

In closing I offer a few final words of advice on the management of patients with irreversible hearing loss.

Discuss their problems with them frankly.

Tell them the nature of their deafness and why they cannot be helped by medical or surgical treatment.

Gain their confidence by telling them the score and what they can do to balance the score.

Be positive and firm with your advice but give them encouragement.

Do not give them sympathy. They crave sympathy but already pity themselves too much.

Do not tell a patient his hearing will get worse. Hedge, if you must, by saying that adjustments, training and hearing aids will more than counterbalance any further hearing loss.

Never tell a patient that he will become deaf. The greatest phobia the hard of hearing experience is the fear of total deafness. Reassurance on this point alone frequently will be of more benefit to the patient than all the medical and surgical therapy we can offer.

It takes time and effort to convince hard-of-hearing people that they must accept their handicap as an actuality before they can be guided onto the path leading to necessary readjustments and rehabilitation. If we consider ourselves to be real otologists we will gladly expend this time and effort in their behalf.

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## PRIMARY TUMORS OF THE NASAL SEPTUM.\*

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Primary tumors of the nasal septum are not common. The various types encountered in this location and the problems peculiar to their treatment are discussed. Eleven patients with tumors of the nasal septum are reported.

Theoretically, a tumor arising from any of the histological elements of the septum could occur in this area; however, a review of the literature reveals certain types to predominate.

*Hemangiomas:* A variety of tumors of blood vessel origin have been reported, and these are classified according to the predominant vascular element into cavernous and simple types. The common location is Kiesselbach's area (see Fig. 1).

Cases have been reported by Callison,<sup>1</sup> Tilley,<sup>2</sup> Rosenthal,<sup>3</sup> Dabney,<sup>4</sup> Scuderi,<sup>5</sup> Franchini,<sup>6</sup> Klemptner,<sup>7</sup> Maekawa,<sup>8</sup> Weidlein,<sup>39</sup> and Salinger.<sup>40</sup> Salvatore<sup>9</sup> reported two cases, one a cavernous angioma and the other a hemangioendothelioma. Weidlein<sup>10</sup> reported three cases, one with a question of early malignant change.

Clinically these are characterized by repeated nasal bleeding and varying degrees of obstruction, depending upon the tumor size. Examination reveals a reddish-brown polypoid mass attached to the septum, usually by a narrow base. Manipulation frequently results in vigorous bleeding (Case 4). The usual anterior location of these lesions suggests that digital trauma may be an etiological factor (Case 8).

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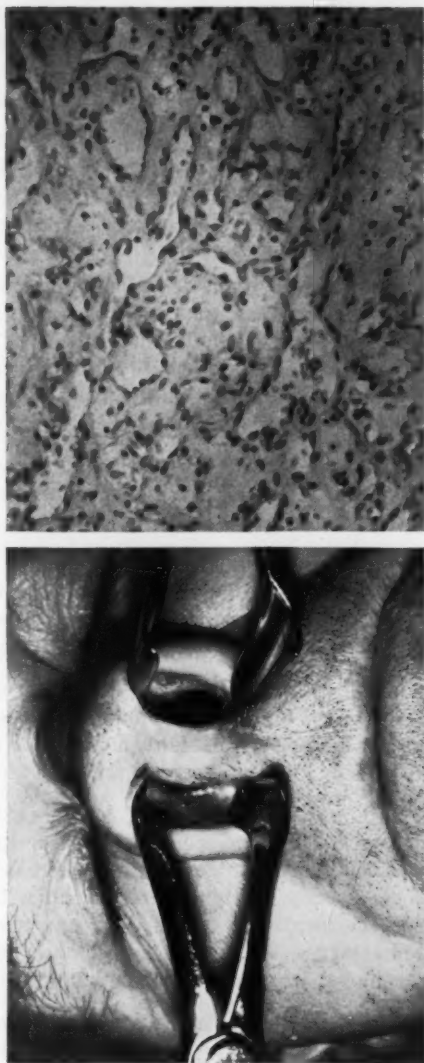


Fig. 1. Black and white print from the kodachrome original of Case 4 showing the pedunculated hemangioma in Kieselbach's area.

Local excision with cauterization of the base is usually adequate for the small lesions. The more extensive tumors are best treated by preliminary radiation<sup>40</sup> to reduce the vascularity followed by surgical excision.

*Endothelioma:* Eggston<sup>10</sup> states that endotheliomas in the nose are presumably often classified as "mixed tumors of salivary type." He feels many endotheliomas might be more accurately labeled mixed tumors, and that they should be considered to be of borderline malignancy.

Higushi and Shirawa<sup>11</sup> reported a hemangioendothelioma of the septum, Zarahune<sup>12</sup> a myxoendothelioma, and Gon<sup>13</sup> a lymphendothelioma of the vestibule. In appearance and symptoms these tumors are similar to those outlined for hemangiomas (Case 9). Cautery excision is usually adequate.

*Mixed Tumors:* These are smooth, encapsulated, slow growing tumors composed of several tissue elements. There is a marked tendency to recur after incomplete excision. Cauterization is a useful adjunct.

Stevenson,<sup>14</sup> Weidlein<sup>15</sup> and Ersner<sup>16</sup> have each reported a case. Ersner's was successfully removed by an external incision. Nasal obstruction and external deformity were present. Vermeuw and Goormaghtgh<sup>17</sup> report a cylindroma of the septum.

*Adenoma:* Eggston<sup>10</sup> states that adenomas in the nose are usually on the septum or turbinates. They appear as red sessile or pedunculated vascular masses and are amenable to wide local excision.

*Fibroma:* A pedunculated fibroma of the septum was described by Simpson,<sup>18</sup> who states that granulomas, angiomas and fibromas are usually in the anterior half of the septum while myxomas are located in the middle or posterior third. Silva<sup>19</sup> reported a large, slow growing fibroma of the septum. In both cases removal was accomplished surgically.

Grossly these lesions are pale, firm, mucosal-covered, pedunculated lesions which enlarge very slowly. Local excision is the treatment of choice.

*Neurilemmoma:* Bogdasarian and Stout<sup>20</sup> describe a poly-poid nerve sheath tumor which was snared from the septum and the margins cauterized. They were unable to locate any similar case in the literature.

The mass is described as a reddish-pink, ovoid, firm, non-tender mass attached to the left side of the septum in Kieselbach's area. Case 11 is a similar tumor with more extensive involvement of the septum. Local excision without cauterization was effective.

*Dermoid Cyst:* Juers<sup>21</sup> reports one case removed intranasally.

*Plasma Cell Tumor:* Blumenfeld<sup>22</sup> in his review of plasma cell tumors of the nose and nasopharynx includes one case involving the nasal septum reported in 1925, by Facchini and Scalas.

Clinically the mass is soft, gray and friable and bleeds easily on manipulation. Local bone involvement occurs. Radical local excision and cauterization is indicated.

*Chondroma:* Howarth<sup>23</sup> reports one case of chondroma involving the anterior septum which excised surgically. He found two other cases in the literature.

The gross appearance is similar to that of other chondromas and the symptoms are those of obstruction and external deformity. Local excision if complete is all that is required.

*Chondrosarcoma:* Owen<sup>24</sup> describes a patient with a red, smooth mass arising from the nasal septum with occlusion of both posterior nares. This was removed and a microscopic diagnosis of chondroma was made. The lesion recurred, however, and further examination of the tissue subsequently removed suggests a chondrosarcoma. Radical local excision followed by cauterization or radiation is indicated.

*Giant Cell Tumor:* Bjuggren<sup>25</sup> reports a patient with a giant cell tumor of the right nasal cavity; the origin, however, was from the turbinate rather than the septum. Case 3 represents a true giant cell tumor of the nasal septum. The

external appearance was that of a simple, firm, fibrous polyp of the anterior portion of the nasal septum. No ulceration was present (see Fig. 2). Local excision should include the underlying cartilage.

*Papilloma:* Geschickter<sup>26</sup> feels that benign epithelial tumors of the nose are rarely reported because they are slow growing and relatively asymptomatic. Kramer and Som<sup>27</sup> classify papillary growths in the nose as follows:

1. Mucus polyps.
2. Cutaneous warts. These are usually located on the nasal septum or vestibule.
3. Papillary carcinoma or malignant papilloma.
4. True papilloma or papillomata dura. These are of two types, one consisting of a cauliflower-like growth with a narrow or wide base (see Fig. 3), and the other composed of diffuse small nodules.

In reviewing the literature to 1856, they have listed five instances where the papilloma primarily involved the septum.

There is a marked tendency for local recurrence. Klemptner<sup>7</sup> reports a case with diffuse involvement of the nostril which he removed five times in five months. Nasal obstruction is the chief symptom and malignant degeneration can occur. Wide local excision with extensive cauterization of the margins is indicated.

*Epidermoid Carcinoma (Papillary) or Malignant Papilloma:* Kramer and Som<sup>27</sup> report a papilloma which underwent malignant degeneration and Case 2 shows a similar process in the nasal septum (see Fig. 4).

Clinically these are extremely vascular, friable, reddish-gray tumors which bleed frequently and profusely. The bleeding may be noticed long before the obstruction becomes a problem. Wide local cautery excision is indicated, followed by local radiation in large lesions. A neck dissection need not be routinely carried out. Hemorrhage is a problem.





Fig. 2. Black and white print from the kodachrome original on Case 3 showing a pedunculated giant cell tumor in Kieselbach's area on the right side of the nose.

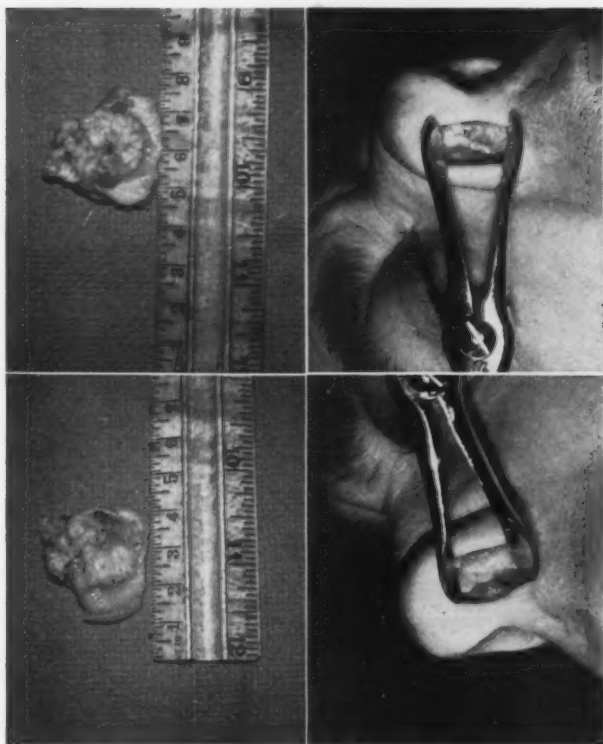


Fig. 3. Black and white print from the kodachrome original of Case 10 showing an extensive, warty squamous papilloma which involves both sides of the cartilaginous and bony septum. Both sides of the resected septum are shown.

*Lymphoepithelioma:* This lesion is usually confined to the nasopharynx; however, one case involving only the posterior nasal septum is reported (see Fig. 5). Treatment has included external radiation, radium, surgical excision and electrocoagulation.

*Malignant Melanoma (Melanosarcoma):* Smith<sup>36</sup> warns that malignant melanoma must be considered in the differential diagnosis of papillomas of the anterior nasal cavity.

The origin of malignant melanomas within the nasal cavity is not clear. They may arise from misplaced cutaneous cell

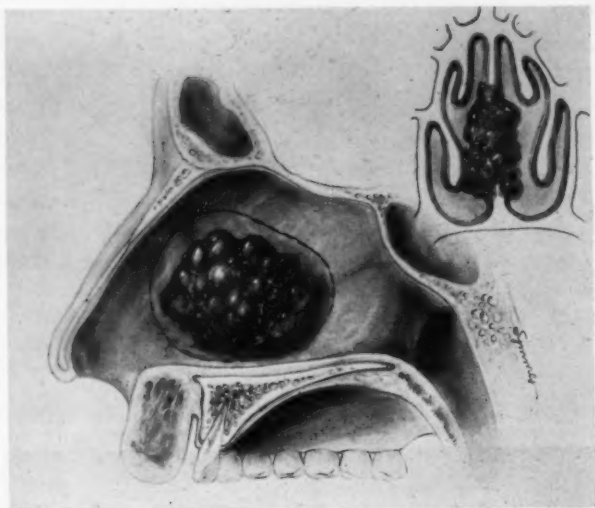


Fig. 4. Semischematic drawing of a papillary epidermoid carcinoma primarily in the septum with a "kissing" metastasis of the right inferior turbinate, Case 2.

rests and are also seen in the rectum, which is another mucocutaneous junction. The growth of these lesions is slow prior to metastasis and they are amenable to surgical excision with or without radiation. Kaplan<sup>28</sup> states that the common location of these tumors is either on the septum or lateral nasal wall.

The gross appearance of the lesion is a mushy, black, polypoid mass which bleeds readily on manipulation. The chief symptoms are obstruction to breathing and bleeding. Metastasis occurs in approximately 50 per cent of these lesions.

Cases have been reported by Lewy,<sup>29</sup> McKensie,<sup>30</sup> Smuts,<sup>31</sup> Munroe,<sup>32</sup> Margarat, *et al.*,<sup>33</sup> Fujita,<sup>34</sup> and Brandao.<sup>35</sup> Recurrence among the reported cases is frequent. Radical local excision with appropriate neck dissection followed by radiation seems to offer the best hope of arresting this disease.

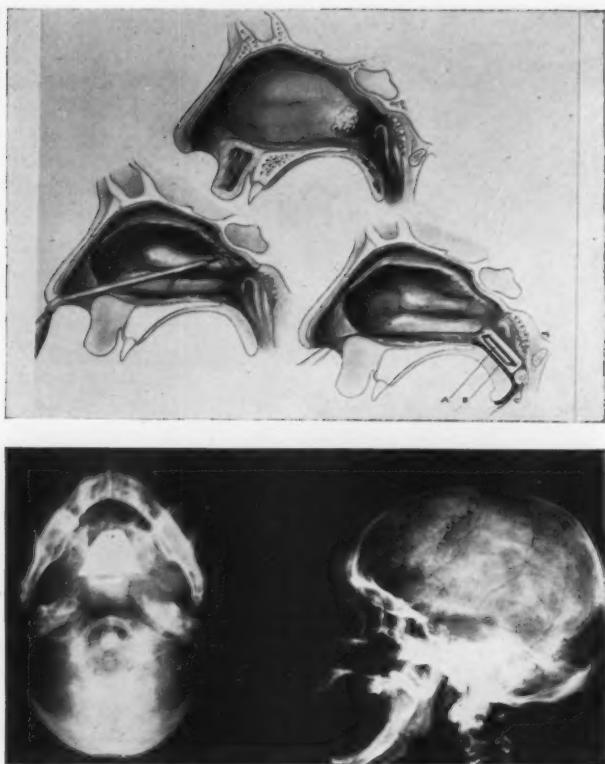


Fig. 5. Semischematic drawing showing a small lymphoepithelioma involving the bony posterior septum, Case 1. The septal resection was carried out with punch forceps and the base electrocoagulated as shown with a special nasal tip. (A) Dental wax block containing four 10 mg. radium needles. (B) Curved lead shield used to protect the underlying palate. (C) Gauze postnasal plug. Radiograph shows the lead shield and radium in situ.

*Hypernephroma:* Fanoe<sup>37</sup> reports a hypernephroma of the nasal septum in a patient who previously had a kidney removed for this condition.

*Sarcoid:* Fletcher<sup>38</sup> describes four patients with sarcoid of the nose. Three of these had primary septal involvement.

They were characterized by small, reddish, granular nodules on the septum. He reports that surgical excision was successful in two cases. Electrocoagulation did not seem too effective.

*Tuberculosis:* Videgain<sup>41</sup> reports a case of tuberculous granuloma of the septum. This as well as syphilis must always be considered in the investigation of any septal mass.

*Treatment:* In many cases reviewed from the literature, and in Case 3 reported here, inadequate removal of the original lesion resulted in recurrence. This necessitates subsequent radical resection which might not otherwise have been necessary. One cannot stress too strongly the importance of the initial treatment. This procedure should always be more extensive than would first seem indicated.

The following procedures have been adopted as a result of the preceding study:

1. Small posterior polypoid lesions are resected locally and the base cauterized.

2. Small, discrete, anterior lesions are not biopsied. The surrounding mucosa and attached cartilage are removed under local anesthesia, leaving the mucosa on the opposite side intact (see Fig. 6). Vaseline gauze packing is placed over the defect for 24 to 48 hours and no cauterization is used. Complete epithelization occurs over the intact mucosa of the opposite side in four to six weeks. Vaseline is used to prevent crusting and there is no disability during this period. More extensive lesions are first biopsied for diagnostic purposes and this is checked against the cytological smear findings.<sup>43</sup>

3. Large, benign, mucosal-covered lesions are resected intranasally with an adequate margin and the edges of the septum are cauterized (see Fig. 7). General anesthesia is preferred because of the discomfort incident to adequate coagulation. When the lesion involves the bony septum the cartilaginous portion is excised *en bloc* and that attached to the bony portion is removed with punch forceps. There is sequestration of devitalized bone fragments from the margin during the healing process. Epithelization is complete in six to eight weeks.

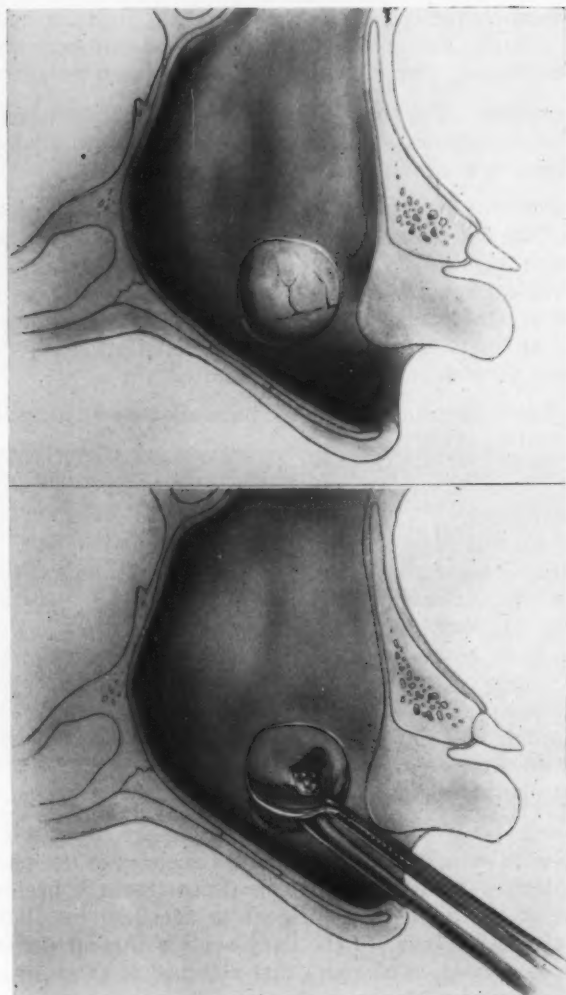


Fig. 6. Semischematic drawing showing the submucous method of excising small lesions with the underlying cartilage, Case 10.

4. Large, fungating, ulcerated, malignant lesions are treated in a similar manner except that the maximum margin is

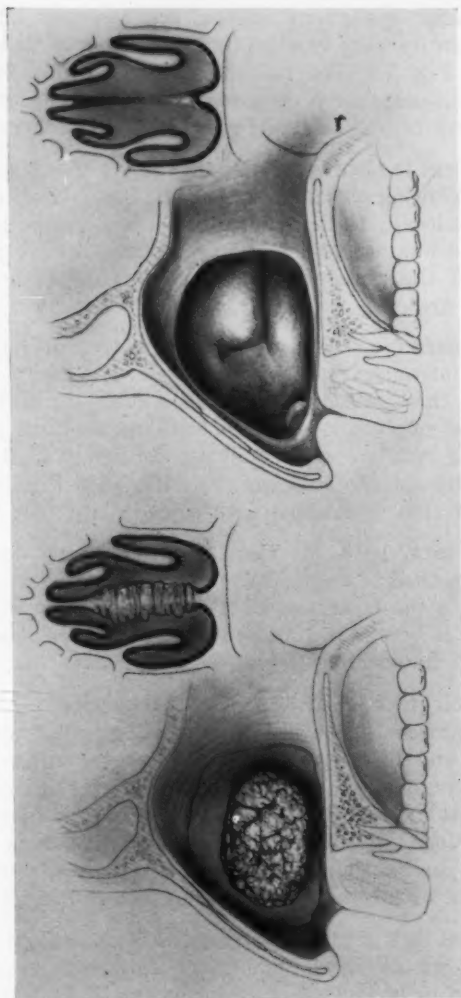


Fig. 7. Semi-schematic drawing showing the initial lesion and final septal resection for a squamous papilloma, Case 5.

obtained and the subsequent fulguration is very extensive. The period of sequestration and epithelization is consequently prolonged.

5. Posterior malignant lesions are resected intranasally with the entire posterior septum and most of the anterior part (see Fig. 5). The margins are thoroughly fulgurated. The extensive septal resection is carried out in order to facilitate subsequent observation for evidence of recurrence.

The patient is always advised that nasal crusting may be a problem following a radical septal resection. This is controlled by vaseline locally to the anterior naris and steam inhalations during cold weather. Nasal douching has not been necessary. In none of the cases was any postoperative external nasal deformity present.

Recurrences (see Fig. 8) are treated by recauterization, followed by intranasal radium radiation. The septal resection facilitates this procedure (see Fig. 11). Careful advance planning is important so as to have the radium needle attached to a retainer which will remain firmly in the correct position and deliver uniform radiation (see Fig. 5A). The uninvolved area is shielded with a lead plate (see Fig. 5B).

In February, 1948, Morrison and Low-Beer<sup>43</sup> developed a practical method of using Radioactive Cobalt 60 as a radium substitute in the treatment of nasal tumors (see Figs. 9 and 10). This is being used and the results are promising. The half life of Radioactive Cobalt 60 is 5.3 years.

The Cytological Smear Technique as described by Morrison, *et al.*,<sup>42</sup> has been most useful in finding early recurrences (Case 1) and as a simple method of evaluating radiation cellular change (see Fig. 11). They report 138 cases examined by this method and in no instance was a false positive smear obtained. Two cases with negative smears in the presence of a positive biopsy were explained by the absence of involvement or ulceration of the surface epithelium.

Malignant cells may be found in smears obtained from the surface of an ulcerated, malignant epithelial lesion of the nose, throat or larynx, no matter how small. The smear technique is now routinely used in all malignant tumors of the nose and throat. It is most useful in the evaluation of the effect of treatment.



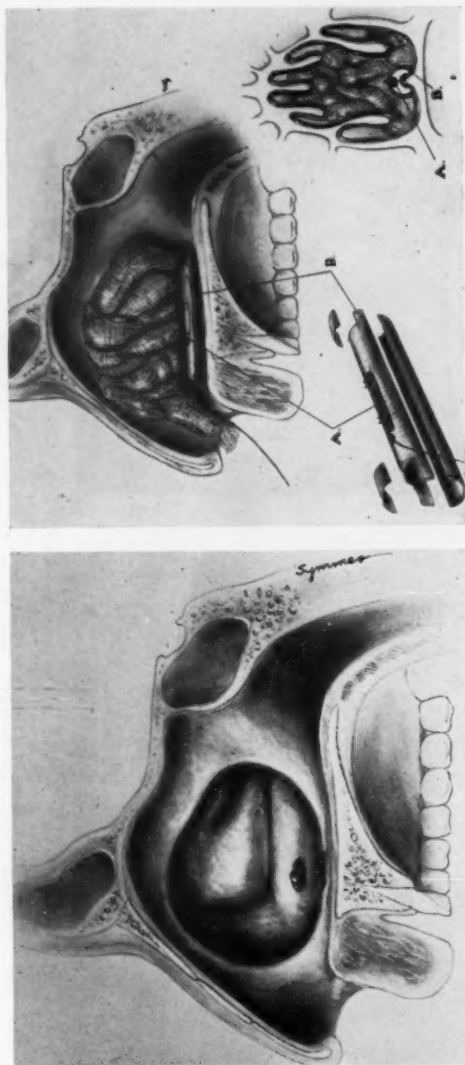


Fig. 8. Schematic drawing showing small local recurrences in the inferior turbinate and base of the septum. The radium was fixed to a segment of rubber tubing and inserted following revascularization of the lesion. Gauze packing is used for fixation, Case 2.

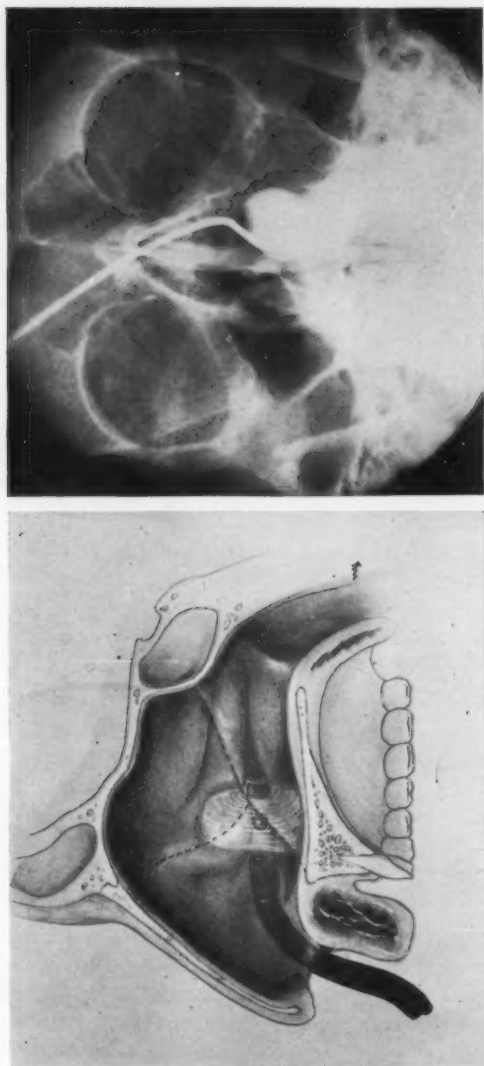


Fig. 9. Schematic drawing showing the method of applying the radioactive cobalt bead to the interior of the nose. The bead is fixed in position by an inflated Foley urethral catheter. The radiograph shows the Foley bag outlined with diodrast. The bead is just visible in the center of this.

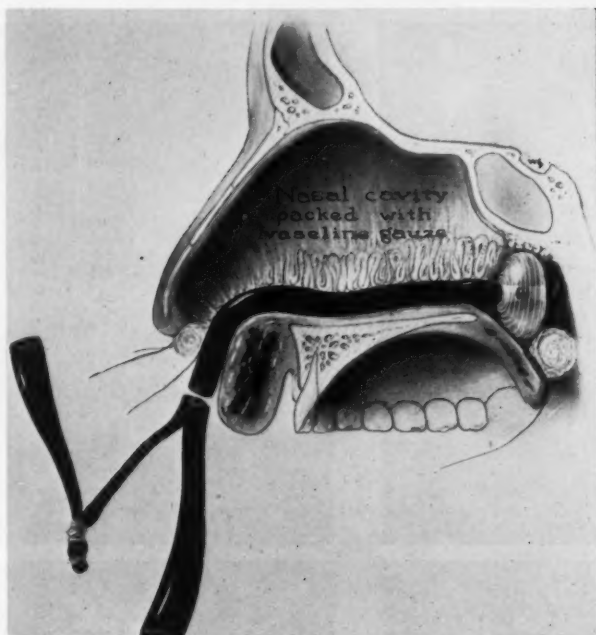


Fig. 10. Semischematic drawing showing the method of treating nasopharyngeal tumors with radioactive cobalt.

Epithelial cells as seen on the smear undergo the following progressive radiation changes:

1. Swelling.
2. Foamy cytoplasm.
3. Nuclear swelling.
4. Granulation of the chromatin.
5. Fragmentation of the cell.

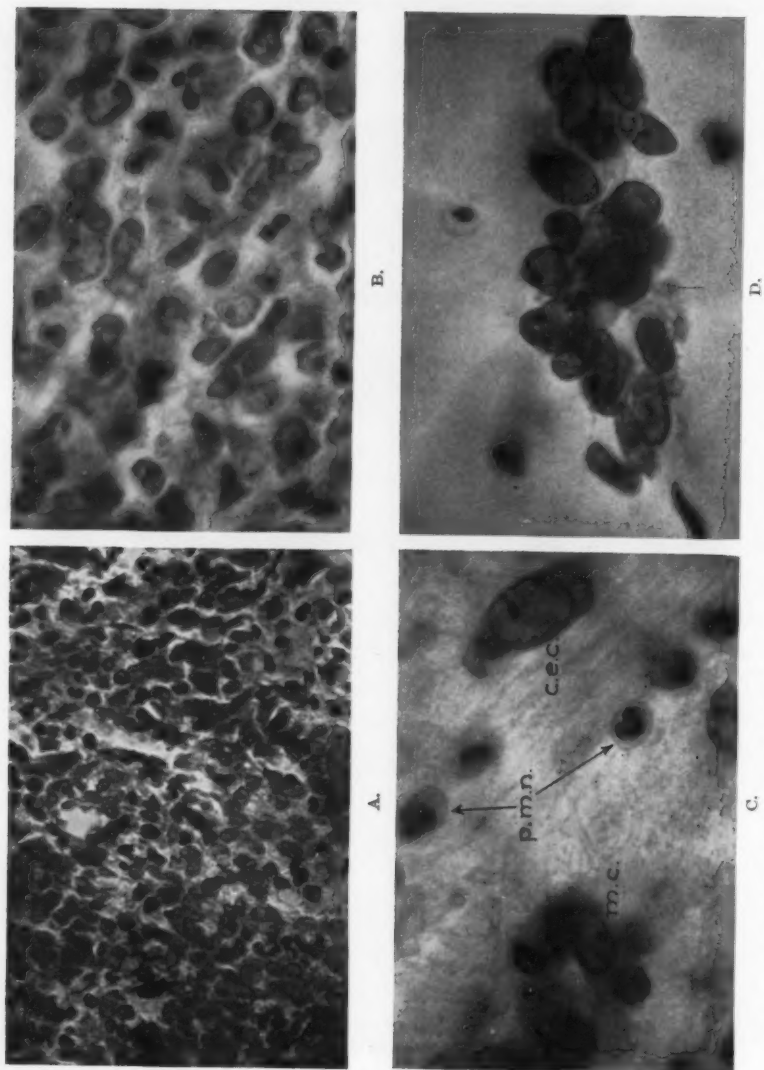


FIG. 11. Black and white photomicrograph of a lymphoepithelioma, Case 1. (A) High dry field showing cellular pattern. (B) The same area with oil immersion. Mitoses can be seen. (C) Cytological smear from the surface of the lesion showing (m.c.) malignant cells, (p.m.n.) leucocytes, (c.e.c.) degenerating ciliated epithelial cell. (D) A clump of malignant cells seen in a cytological smear. Note the marked similarity of these cells to those seen in the biopsy above.

Malignant cells differ from the normal cells by virtue of:

1. Irregular size and shape.
2. Loss of cytoplasm.
3. Coarse patchy chromatin.
4. Thick nuclear membrane.
5. Formation of multinucleated cells with irregularly sized nuclei.

We have not employed the more radical external operations of Mouré and Denker for primary septal tumors. These approaches have been successfully used by others particularly for larger tumors.

Carotid ligation was not found to be necessary even in the largest and most vascular tumor of the series. In one instance (Case 2) packing was necessary to control the massive hemorrhage before electrocoagulation could be completed.

#### SUMMARY.

1. Primary septal tumors are uncommon.
2. The literature is reviewed and the clinical characteristics outlined.
3. The importance of sufficiently radical initial surgical resection is stressed.
4. An appropriate intranasal surgical procedure for each group is outlined and illustrated.
5. Methods of supplementary intranasal radiation are described and a new method is presented.
6. The cytological smear technique has proven of value in diagnosis and treatment.

7. Eleven illustrative cases are reported. These include:

1. Lymphoepithelioma.
2. Papillary epidermoid carcinoma.
3. Giant cell tumor.
4. Hemangioma.
5. Papilloma.
6. Squamous carcinoma.
7. Inflammatory polyp.
8. Granuloma.
9. Hemangioendothelioma.
10. Squamous cell papilloma.
11. Glioma.

#### CASE REPORTS.

*Case 1:* E. M. H., white male, age 59; U. 121770. This 59-year-old male druggist was first seen at the University of California Hospital, Out-Patient Department, on Aug. 12, 1945. A letter stated that in December, 1942, a submucous resection was carried out and a large polyp was removed from the right side of the nose in the region of the right middle meatus. Following this surgical procedure he complained of persistent pain, postnasal discharge and bleeding from the right side of his nose.

Biopsy was taken from this area on June 9, 1943, and this was reported as follows: "The tumor consists of a large mass of cells supported by very small amounts of stroma. These cells are pale staining and have very poor outlines. These are fairly small and have round central granular pale staining nuclei. Intermingled with these tumor cells are found inflammatory cells, lymphocytes and polymorphonuclear series. Mitotic figures are fairly numerous. There is no cellular pattern. *Diagnosis:* Anaplastic carcinoma of the nose, grade 4 (so-called lymphoepithelioma group)."

The patient was given four intranasal radium applications in October, 1943, consisting of contact radium applicators of 50 mg. with 1 mm. platinum filter. A total of 600 mg. hours of contact therapy was given in a two weeks period.

Examination on Oct. 12, 1945, two years later, reveals a small amount of pale pink tissue between the inferior and middle turbinates on the left side posteriorly. No bleeding was seen. There was also a small knob of tissue posteriorly in the left choana at the posterior border of the

septum. The remainder of the ear, nose and throat examination was normal. General medical examination was normal except for incipient diabetes mellitus and some arthritis of the lumbar spine. The patient continued to complain of pain, headache and nasal discharge until March 10, 1948, at which time direct nasopharyngoscopy showed a pea-sized, rather granular vascular appearing swelling of the left side of the nasal septum. It was felt that this possibly represented a recurrence and again a biopsy was taken. Microscopic diagnosis of this tissue revealed transitional cell carcinoma of the nasopharynx.

In July of 1947 the patient had received a total of 1,250 r. to a 3 x 5 cm. field over the left side of the nose for a superficial skin condition. Because of this and his previous radiation therapy it was felt that further radiation at this time was inadvisable. He was, therefore, admitted to the University of California Hospital on May 26, 1948, and on the following day was taken to surgery, where under avertin anesthesia supplemented by intratracheal nitrous oxide and oxygen, careful exploration of the nose revealed a raw, ulcerated area on the extreme posterior margin of the nasal septum. This measures approximately 0.5 x 1 cm. size. A previous submucous resection had been done and was well healed except for a 2 x 4 mm. anterior-inferior perforation of the septum just above the vomer process. By means of a sharp knife the entire septum was excised from a point 1.5 cm. posterior to the anterior border of the cartilaginous septum. The bony part of the septum remaining was removed by means of sharp rongeurs and the vomer ridge was taken down flush with the palate by means of a mallet and gouge. Considerable bleeding was encountered but this was controlled by means of packing. At the close of the procedure the entire posterior portion of the nasal septum was extensively coagulated by means of a Bovie unit. This fulguration included the anterior base of the sphenoid, and the base of the bony septum inferiorly. No evidence of tumor was found in the portions of the septum which were resected. Smears taken from the lesion prior to surgery and stained by the Papanicolaou stain showed evidence of malignancy in the nasal secretions.

He was followed in the outpatient department and continued to complain of pain and headaches. Re-examination of his Papanicolaou smears on July 28, 1948, showed malignant cells to be still present in the nasal secretions.

X-rays of the base of the skull showed no evidence of malignant involvement of this area.

The patient was again admitted to the University of California Hospital on Aug. 13, 1949, and taken to surgery on the following day, at which time he was anesthetized by means of avertin and intratracheal nitrous oxide and oxygen anesthesia. Inspection of the nasopharynx and vault and base of the nasal septum failed to reveal any evidence of gross malignancy. Biopsy specimens were taken from the vault, the base of the septum and the nasopharynx, after which a very thorough cauterization was carried out in Rosenmüller's fossa and over the vault in the nasopharynx. Similar cauterization was carried out at the base of the nasal septum and the posterior portion of the hard palate. No bleeding was encountered and the patient was returned to the ward in good condition.

Biopsy report of the specimens obtained from this procedure showed nasopharyngeal mucosa with acute and chronic inflammation and granulation tissue. There was no evidence of malignancy.

The patient continued to complain of headache, pain and bleeding from his nose and smears taken from a roughened area at the vault of the nasopharynx continued to reveal positive malignant cells by the Papanicolaou technique.

The patient was readmitted to the University of California Hospital on Oct. 13, 1948, and on the following day he was taken to surgery and anesthetized by means of cyclopropane and ether anesthesia. The nasopharynx was exposed by means of a tonsil gag into which a hard, wax plaque containing four 10 mg. radium needles in a rectangular fashion was inserted into the nasopharynx so as to obtain uniform radiation over the vault of the nasopharynx and the superior margin of the nasal septum. The soft and hard palate were protected from radiation by means of a lead shield which was fixed in position by means of anterior linen strings which were tied to an anterior nasal bolster. The lead plate and radium pack were held in position by anterior and posterior gauze packing which was allowed to remain in place a total of 26 hours, which amounts to 1,040 mg. hours at 1 cm. or is the equivalent of 4,900 r. equivalents.

Following the application of the radium the patient improved markedly, his pain disappeared and except for some drying and crusting in the nasopharynx he was without symptoms. His Papanicolaou smears became consistently negative and have remained so to the present time, now nearly one year after his last treatment.

*Case 2:* M. D. C., white female, age 64. The patient was admitted to the University of California Hospital on Oct. 16, 1946, complaining of a progressive nasal obstruction associated with postnasal discharge from the right nostril of one year's duration. She had had two biopsies prior to admission, followed by extensive and profuse bleeding from the right side. There was no obstruction to breathing on the left side. There were no other significant findings in the history.

Examination of the nose revealed a soft friable mass involving the right side of the nasal septum and extending submucosally beneath the left side of the nasal septum. This mass occludes the entire nasal fossa on the right side from the vestibule anteriorly to the floor inferiorly and does not involve the posterior choana. The color is a pale pink hue. By means of nasopharyngoscopy the mass on the right side could be seen to extend almost to the posterior naris on this side but did not involve it by actual extension. No cervical glands were present on either side. The remainder of the ear, nose and throat examination and general physical examination were not remarkable.

On Oct. 17, 1946, the patient was taken to surgery, and under local anesthesia the entire septum including the tumor mass was resected, care being exercised to leave sufficient septum anteriorly for support of the nose, and a small amount of the posterior margins of the bony septum was found to be uninvolved and this was left intact. It was planned to carry out an extensive cauterization of the margins of the defect at this time; however, the bleeding was so profuse as to preclude the possibility of effective coagulation. Consequently the area was packed by means of anterior-posterior pack. The patient was returned to the ward in good condition. She was given a 500 cc. whole blood transfusion the afternoon of the day of surgery and three days later under general anesthesia with intratracheal intubation the nasal packing anteriorly and posteriorly was removed cautiously and the underlying tissue cauterized as the packing was withdrawn. This way a very thorough electrocoagu-



lation was carried out on all the margins of the remaining nasal septum and of the adjacent right inferior turbinate where a small kissing lesion was found to be present following removal of the main mass. The area was again packed and the patient returned to the ward in good condition. The packing was slowly removed on the second and third postoperative days, and her postoperative convalescence was uneventful.

She was discharged on Oct. 23, 1946, with instructions to return weekly for observation. Her laboratory examination, including routine blood, urine and serology, was negative.

*Pathological Report: Gross Description:* The specimen consists of eight irregular pieces of tissue; five are pale pink with a cauliflower appearance, ranging in size from 1.5 x 1 cm. to 2 x 1.5 cm. Two of similar size are flat with smooth, grayish-pink surface. The eighth piece is a piece of cartilage measuring 0.2 x 0.3 cm.

*Microscopic:* The cauliflower masses show stratified, apparently squamous epithelium that is hyperplastic, forming a papillary projection with thin connective tissue stroma. The cells are hyperchromatic and pleomorphic with marked variation of nuclear size and frequent mitoses. The remaining tissue consists of respiratory epithelium overlying a connective tissue containing many mucous glands. The cartilage is normal, but contiguous to it are masses of large epithelial cells with pale, spongy cytoplasm and irregularly sized nuclei showing occasional mitosis.

*Diagnosis:* Papillary epidermoid carcinoma.

Examination one month later revealed evidence of a small local recurrence on the right inferior turbinate. Consequently on Nov. 21, 1946, she was readmitted to the University of California Hospital and under local anesthesia a very extensive electrocoagulation was carried out, particularly over the right inferior turbinate, and again the margins of the nasal septum resection were cauterized with electrocoagulation. Biopsies were taken prior to coagulation. Pathological report of these specimens reveals recurrent carcinoma of the squamous cell type in the nasal septum. This carcinoma was evident both in the specimen removed from the right inferior turbinate and that removed from the base of the septum. The patient's course following this coagulation was uneventful for approximately nine months, at which time she showed evidence of a very small recurrence at the base of the septum in the midportion of the vomer. She was therefore readmitted to the University of California Hospital on Aug. 29, 1947, at which time a 25 mg. radium needle was attached to a half section of rubber tubing which was so cut as to slip into the septal defect and fix the radium over the local recurrence. This was held in position by a packing. She was given a dose of 250 mg. hours, which is the equivalent of 6,250 r. Following the removal of the radium her subsequent course has been entirely uneventful. When she was seen in May of 1949 there was no evidence of recurrence two years and six months after her original diagnosis was established.

*Case 3:* C. N. S., white male, age 52 years; U. 43596. This unemployed male was first seen in the ear, nose and throat clinic on June 20, 1939, complaining of frequent bleeding from the right nostril. A small polyp was seen on the right side of his nasal septum in Kiesselbach's area and this was the lesion which was producing the bleeding. It was cauterized with chromium trioxide, and he had no more trouble with his nose until he presented himself again in the ear, nose and throat clinic on July 29,

1947, eight years later, complaining of consistent nasal obstruction on the right side of five months' duration. The nasal obstruction is almost complete and constant, associated with crusting in the right nostril.

Examination revealed a 1 cm. polypoid mass arising from Kiesselbach's area on the right side of the nasal septum which was ulcerated on the anterior surface. The mucosa otherwise appeared normal. The area was photographed and the lesion was excised locally with cautery to the underlying base.

Microscopic examination of the excised tissue showed a superficial layer of stratified squamous epithelium and small areas of erosion covered by coagulated fibrin and necrotic cells. The epithelium is thick and has papillae which are narrow and deep. There is no invasion or evidence of malignant change. The underlying connective tissue contains a condensation of cellular connective tissue elements. Large fibroblastic cells of varying size and shape are present between strands of connective tissue. Giant cells with eosinophilic cytoplasm and five to 10 centrally placed small oval nuclei are interspersed throughout the tumor and are most numerous adjacent to the osteoid tissue. Numerous small, vascular channels are present and are prominent in some places. A few small accumulations of brown pigment granules are noted within the growth. Mitoses were not seen.

*Diagnosis:* Giant cell tumor of the nasal septum.

X-rays of the skull with special attention to the nasal septum failed to reveal any evidence of disease involving the nasal septum or skull.

Because of the diagnosis of giant cell tumor of the nasal septum and gross evidence of involvement of the cartilage of the septum it was felt advisable to resect the nasal septum beneath the involved area. The patient was admitted to the University of California Hospital on Aug. 29, 1947, and was taken to surgery on the following day, at which time a circular area of cartilaginous septum containing the mucosa on both sides was removed over the area as large as a five-cent piece. This left a large central septal perforation but this was felt preferable to a recurrence of his tumor. The area was packed with vaseline gauze packing, which was removed on the following day, and the patient returned home.

Microscopic examination of the excised septum revealed scattered throughout the mass numerous round or oval giant cells with large amounts of basophilic cytoplasm and three to 12 or 15 centrally placed vesicular nuclei which frequently have a prominent nucleolus. Several small spicules of osteoid tissue and bone are noted adjacent to the attachment of the tumor. The surface is covered by stratified squamous epithelium except for an eroded area where it is replaced by a fibrinopurulent exudate. Diagnosis was giant cell tumor of the nasal septum.

The patient was last examined on May 26, 1948, at which time there was no evidence of recurrence and such crusting mass as was present was controlled by the use of vaseline locally. This was nine months following his septal resection and there was no evidence of recurrence.

*Case 4:* White female, age 30. This physician's wife was first seen in the office on Aug. 6, 1949, with a history of having had a polyp removed from the right side of her nose six weeks previously. She has had recurrent nose bleeds for one year. This bleeding has continued following the removal of the "polyp."

Examination of the nose revealed a 1.5 cm. circular ulcer in Kiesselbach's area on the right side of the nasal septum with cartilage exposed in the central portion. The patient was advised to use vaseline locally to promote healing and inquiry revealed that a 0.5 cm. polypoid, pedunculated, reddish-purple mass had been snared from Kiesselbach's area on the right side six weeks previously. The base was cauterized with chromic acid.

The pathological report was as follows: "The section is composed of a mucoid stroma containing numerous large vascular spaces. In one area there are numerous leucocyte collections with necrosis of tissue. If these had eroded into a vessel considerable bleeding could have occurred. *Diagnosis:* Hemangioma."

Subsequent observations on Aug. 12, 19 and 31, 1949, and Sept. 13, 1949, revealed rapid and uneventful healing. The patient is well at the present time.

*Case 5:* E. P. R., white male, age 48; U. 133351. The patient was admitted to the University of California Hospital complaining of a tumor in the septum of his nose of two and one-half years' duration. He first noticed a small wart in his left nostril two and one-half years ago. He felt that this became infected while working at his occupation as a paint sprayer. He had received a variety of treatments to the area locally, including 300 r. of X-ray therapy and repeated local cauterization by means of a common burning glass using sunlight; all of these without any evidence of regression in size of the tumor mass. The remainder of the history is noncontributory except for an attack of pneumonia in 1919 which resolved very slowly. Question of tuberculosis was raised at this time but could never be confirmed.

Physical examination was normal except for his nose, which showed a large, irregular, warty growth protruding from both sides of the nasal septum anteriorly and extending almost to the bridge of the nose superiorly and the floor of the nose inferiorly. The mass extended approximately 2.5 to 3 cm. posteriorly and involved part of the cartilaginous and bony nasal septum. Both nares were completely occluded by the growth. The superficial surface was whitish in color and warty in consistency. A metal probe could be easily passed through the substance of the wart from one nostril to the other, showing almost complete destruction of the cartilaginous septum. There was no involvement of the nasopharynx or roof of the mouth. A biopsy report from this mass was reported by another pathologist as showing an adult, warty growth with marked superficial keratinization and epithelial pearl formation. The microscopic diagnosis was acanthoma. The laboratory work in the hospital was within normal limits.

On Oct. 4, 1946, the patient was taken to surgery and under local anesthesia the entire cartilaginous septum and the anterior half of the bony septum was excised without excessive bleeding. A margin of 1 cm. of good tissue was obtained on all sides of the tumor mass. This necessitated leaving only a 0.5 cm. cutaneous band of tissue anteriorly in the nasal septum; however, it was sufficient to give a normal external appearance. The edges of the excised area were cauterized extensively by means of electrocoagulation and no packing was needed. The patient was discharged on Oct. 6, 1946, after an uneventful hospital stay.

The pathological report of the excised tissue is as follows:

*Gross Description:* The specimen consists of a resection of the cartilaginous nasal septum. The septum is covered on either side by a thick, yellow mucous membrane approximately 0.2 cm. in thickness and in one extremity gives way to a skin containing multiple hairs. The greatest approximate dimensions of this specimen is 2.5 x 1.7 x 1.3 cm. The cartilaginous septum is 0.1 cm. in thickness on either side of the nasal septum and infiltrating into it is a large grayish-white papillomatous lesion which has infiltrated and destroyed the cartilage of the nasal septum. This specimen has three grossly adequate margins present along one edge of the septum.

*Microscopic:* The sections show the nasal cartilaginous septum to be eroded away by connective tissue showing marked chronic inflammatory changes. Replacing the cartilage are long cords and columns of stratified squamous epithelial cells which are in complete continuity with one another. These epithelial cells are arranged in a papillomatous pattern. The surface of the epithelium shows various degrees of keratinization and parakeratosis and within the center of some of the columns and mass of cells epithelial pearl formation is seen. Everywhere the epithelial cells maintain a basement membrane and there is no evidence of invasion. The epithelial cells show the normal degree of variation in maturity of cells but no unusual pleomorphism, and mitotic figures are extremely infrequent.

*Diagnosis:* Benign nasal papilloma of the nasal septum. Pathology S. P. 46.2501.

The postoperative course of this patient has been uneventful and he has been seen regularly at one month, three month and, lately, six month intervals. He was last seen in May, 1949, two and one-half years after his original excision and there was no evidence of recurrence of the lesion. He is bothered during cold and dry weather by excessive crusting within his nose, but this is easily controlled by means of steam inhalations and the use of vaseline locally in his nose.

*Case 6:* J. F. S., male, age 72; Unit 169673. The patient presented himself at the University of California Hospital, Out-Patient Department, on Aug. 22, 1949, complaining of a small growth in the left nostril, which bleeds readily, of three months' duration. Examination revealed a small pedunculated, 4 mm. warty appearing lesion at the upper angle of the left nasal vestibule. The lesion was excised locally, under local anesthesia, and the base cauterized with electrocoagulation. The remainder of the ear, nose and throat examination was essentially normal.

Pathological examination reveals a small 3 mm. mass of tissue composed of piled-up and keratotic superficial epithelium and early pearl formation. There are strands of rather anaplastic appearing squamous cells throughout the tumor mass.

*Diagnosis:* Squamous cell carcinoma of the left nasal vestibule.

Examination in the outpatient department on Sept. 7, two weeks after excision, reveals the area to be entirely healed and free from induration or any evidence of recurrence. It is planned to observe this patient for evidence of recurrence.

*Case 7:* W. S., white female, age 45; Neo. 1012. This patient was first seen in the office on July 25, 1949, complaining of discharge of bloody mucosa from the left side of her nose of one week's duration.

Examination of the nose revealed a 1 x 1 cm. flat, pedunculated polyp which was attached to the midportion of the nasal septum to the left

side at the juncture of the cartilaginous and bony portion, approximately 1 cm. above the floor of the nose and 4 cm. posterior to the anterior nares. Sinus X-rays were obtained and found to be clear. The polyp was removed by simple snare excision and the base cauterized with chromic acid.

**Pathological report is as follows:** This specimen consists of a single, rounded piece of gray tissue 0.8 cm. in diameter. All of the tissue is embedded for microscopic examination.

**Microscopic Diagnosis:** Inflammatory polyp.

**Note:** There are no microscopic evidences of malignancy. The inflammatory reaction is nonspecific.

The patient was well and without recurrence on Sept. 1, 1949.

**Case 8:** A. P., white female, age 84; Neo. 1022.

**Chief Complaint:** A mass on the left side of the nose of four to five months' duration, which bleeds readily on digital manipulation. Examination reveals a small, pea-sized, pedunculated, reddish, friable mass occupying the anterior portion of the left nasal septum at the mucocutaneous border. This bled rather easily on manipulation and appeared to be attached by a rather narrow pedicle. The mass was removed by biting forceps. The base was widely cauterized by means of chromium trioxide.

**Pathological Report:** These are two bits of firm gray-brown tissue measuring 0.6 cm. and 0.5 cm. in diameter.

**Microscopic Diagnosis:** Granulation tissue partly covered by stratified squamous epithellum. There is no evidence of malignancy.

The postoperative course of this patient was uneventful, and the healing was rapid and complete. It was felt that this represented a chronic granuloma as a result of frequent digital manipulations of the nose.

**Case 9:** L. B., white female, age 42; Neo. 1005. This patient was first seen in the office on Feb. 17, 1948, complaining of right-sided nasal obstruction and bleeding of one month's duration. Examination of the nose reveals a 2 x 2.5 cm. fungating, reddish-purple mass which was attached just posterior to Kiesselbach's area on the right side of the nasal septum. A small section of this was removed for biopsy purposes.

The pathological report is as follows: This is a single piece of gray tissue 0.7 x 0.5 cm. in size, all of which is embedded for microscopic examination.

**Microscopic Diagnosis:** Hemangioendothelioma.

**Note:** There are no microscopic evidences of malignancy. This tumor contains numerous vascular spaces filled with varying numbers of red blood cells with the adjacent tissue relatively cellular in some places and composed of endothelial cells.

Local cauterization was considered to be adequate for the control of this lesion, and it was carried out under local anesthesia in the office. Healing required five weeks and since this time there has been no evidence of recurrence. A small amount of local crusting has been con-

trolled by vaseline applied locally to the nose. There was no evidence of recurrence when she was last seen on Jan. 27, 1949, 11 months following removal.

*Case 10:* W. O. B., white male, age 62; Neo. 1013. This patient was first seen in the office on Feb. 18, 1949, complaining of a growth on the left side of his nose. Examination revealed a 1 x 1.5 cc. polypoid, pedunculated mass which was attached to Kiesselbach's area on the left side of the nasal septum. There was some induration of the base of the polyp. The remainder of the ear, nose and throat examination was normal.

On Feb. 24, 1949, the patient was taken to the University of California Hospital and under local anesthesia a circular incision was made around the base of the papilloma, allowing a 1 cc. margin in all directions. This incision was carried through the mucosa and through the cartilage down to the mucosa of the opposite side of the septum. The cartilage plug containing the tumor and mucosa was carefully freed and removed. The area was packed with vaseline gauze which was removed on the following day.

*Pathological Report: Clinical Data:* Male, 62, papilloma, left nasal vestibule, two years. Increased rate of growth last year.

*Clinical Diagnosis:* Papilloma.

*Gross Description:* Small, nonpigmented papillary growth, 6 x 7 mm., firmly adherent to a segment of bone by fibrous tissue.

*Microscopic:* Area of proliferative squamous epithelium composed of uniform adult cells. A layer of connective tissue overlies normal appearing cartilage.

*Diagnosis:* Squamous cell papilloma, nasal vestibule.

The healing required four weeks' time and when last seen he was well and without recurrence on July 1, 1949.

*Case 11:* C. V. S., white female infant, age three months; Neo. 1004. This child was first seen in the office on Nov. 4, 1946. The infant was noted to have an intranasal mass since birth, which has blocked both sides of her nose. During the past two months there has been considerable increase of the size of the mass, which has widened the nasal bones exteriorly. The nasal obstruction interfered with feeding, and there has been no recent weight gain. A biopsy taken one month previously was reported as showing a benign fibroma.

Examination reveals a large, intranasal mass which arises from the superior portion of the nasal septum and apparently has its origin within the nasal septum. The surface is smooth and spherical in shape and measuring approximately 2 x 2.5 cm. in size and completely occluding both sides of the nose. The base of the nose, exteriorly, was widened and there was a 0.5 cm. separation of the nasal bones.

The patient was admitted to the University of California Hospital and on Nov. 11, 1946, under general anesthesia, a large encapsulated, firm, fibrous mass was removed intranasally from within the nasal septum. Very little bleeding was encountered, and it was felt that the entire mass was adequately removed. Subsequent healing was uneventful.

The initial impression of the pathology department was that this represented a simple fibrous polyp showing some inflammatory reaction; how-

ever, subsequent spinal stains revealed that the pale pink fibres gave the characteristic reactions for glial tissue, staining blue with phosphotungstic acid and yellow with Van Geisen's stain. They did not give the characteristic reaction of reticulum with silver. The final diagnosis was atrophy with glial tissue.

The patient was last seen on June 27, 1949, at the age of three years without evidence of recurrence.

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**EFFECT OF GUNFIRE UPON AUDITORY ACUITY  
FOR PURE TONES AND THE EFFICACY  
OF EARPLUGS AS PROTECTORS.\*†**

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It is well recognized that in most individuals, exposure to gunfire of even small calibre arms and shotguns will produce temporary tinnitus and some degree of transient deafness. In some cases these symptoms may persist for an indefinite period of time,<sup>1-4,7</sup> but there is usually a marked diminution of both after a period varying from several hours to several days. In times of peace, few individuals are repeatedly exposed to gunfire at such short intervals that there is insufficient time to recover from these two symptoms which would appear to be indicative of damage to the organ of hearing; however, during the recent war, many of the men of the Army were being repeatedly exposed to such aural trauma, and a considerable amount of fear was expressed concerning the ultimate effect upon their hearing.

In this country, gunnery instructors were in the presence of gunfire more frequently and for longer periods of time than perhaps any other group. An opportunity to study the hearing of a large number of these men was afforded at the Army Air Field, Laredo, Tex. The gross effects of repeated exposure to gunfire had become apparent to the personnel of that station, for certain of the instructors had become extremely deaf, while many of the others were conscious of a continuous ringing in the ears.

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†This project was performed while the author was stationed in the Ear, Nose and Throat Research Department of the A. A. F. School of Aviation Medicine, Randolph Field, Tex. The use of the school's facilities and the cooperation of the other members of its staff made this work possible.

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While it is desirable and necessary to demonstrate the existence and potential magnitude of a deleterious effect such as the hearing loss produced by gunfire noise, it is more important to evaluate the preventive measures which may minimize or eliminate the damage. For this reason it was decided that a field test of various types of ear protectors should be performed.

Earplugs were selected for evaluation in this project because they were apparently the most convenient form of ear protection. This was indicated by the fact that men on the firing line frequently used cotton plugs in their external ear canals and have been known to use many ingenious and subjectively more effective substitutes such as 45 calibre bullets or pencil erasers. The types of earplugs which were chosen for the project had been previously tested and<sup>s</sup> were readily available.

#### METHODS.

In order to determine the effect on the hearing from repeated exposure to gunfire, audiograms were taken on 187 instructors who had served on the firing ranges for from one to 14 months. These ranges included the skeet, moving base, hightower, ground, malfunction and air ranges, which will be discussed in more detail below. Audiograms were also taken on a control group of 184 enlisted students who had not yet begun active gunnery training.

Some of the qualifications of the individuals in the student and instructor groups which could easily distort the comparison of hearing acuity differences may be evaluated by the following. All the subjects in both groups had passed the same conversational voice hearing test for aerial gunners which *presumably* screened out men with gross hearing losses.

The average age of the students was 21.4 years and that of the instructors was 24.1 years. The mode of age for instructors was about two years greater than that for the students and fell within the 21-23 year age group.

A routine ear examination showed that the amount of scarring of the tympanic membranes was not marked among either the instructors or students and that there were no cases of chronic retraction of the drum. A few students were eliminated from the series because of the presence of aero-otitis media which had been incurred during their indoctrination in the altitude chamber. It was noted that the instructors had a high incidence of injection of the tympanic membranes especially when only a few hours' recovery period had been allowed. This was believed to be evidence of trauma inflicted by the concussion blast of gunfire.

While the students had been close to the noise of gunfire (50 and 30 calibre machine guns and 45 calibre pistols) at least in their basic training, there had been a minimum of three weeks since their last exposure. The instructors, on the other hand, had been exposed daily to either shotguns or 30 and 50 calibre machine gun noise for a prolonged period. It was possible to permit an auditory recovery period of 24 to 48 hours before the hearing curves were taken on 106 of this latter group (skeet, moving base, hightower, malfunction No. 2 and air range instructors), but the remainder (ground range and malfunction No. 1 instructors) had left the firing line three to six hours prior to the hearing test.

In order to evaluate the hearing recovery rate following exposure to gunfire, 11 instructors who had been firing 50 calibre machine guns each day every third week were repeatedly tested by audiometric methods during one recovery period of two weeks. Their selection was based upon their convenient schedule rather than on deficient hearing or other factors.

While all of the instructors had initially passed through the flexible gunnery school as students and had thus fired each type of gun on all the various types of ranges, their most prolonged exposure to repeated gunfire had been limited usually to the range to which each individual had been subsequently assigned as instructor. Since there were definite differences

in the physical arrangement and sound intensity of each of the seven types of ranges, a brief description of each range will be given.

*Skeet Range (Shotgun):* These ranges were laid out in the standard fashion with high board fences intervening between each range and its neighbors. The fences tended to reflect the noise when a gun was fired from any position close to them. Almost all of the 12-gauge shotguns employed were fitted with compensators which apparently project a great deal of noise backward. The instructor stood to the side of and facing the student so that he was exposed to the concussion wave. Few of the instructors wore ear protection of any kind. This was also true on the other shotgun ranges.

*Moving Base Range (Shotgun):* On these ranges the student fired from the side of a truck which was moving at the rate of about 25 miles per hour. The instructor was stationed by the side of the student.

*Hightower Range (Shotgun):* These ranges were provided with Martin turrets which were fitted with twin shotguns and mounted on parked trucks. The instructor was located on a platform just behind and above the student, so that he received the maximum concussion only when the gun muzzles were markedly elevated.

*Malfunction Range No. 1 (50 Calibre Machine Guns):* Fixed machine guns were fired on this range with their muzzles protruding through small ports in a wooden wall. A wooden roof covered the guns and, while it extended beyond the plane of the front wall, there was an open space between the two structures which allowed the concussion waves to enter. The blast was painful to the ears unless some type of ear protection was worn. This was true on all the ground ranges where 30 and 50 caliber machine guns were being fired. Both the instructors and students recognized this fact and usually used earplugs of cotton.

*Malfunction Range No. 2 (50 Calibre Machine Guns):* This was similar to the range just described except for the fact that there was no wooden front wall. It was subjectively

the noisiest range encountered and the concussion waves reflected from the roof could be felt by anyone beneath the shed as a powerful slap on top of the head.

*Ground Range (30 and 50 Calibre Machine Guns):* The machine guns used on this range were either hand held or mounted in Martin or Sperry ball turrets. The turrets were mounted on parked trucks and none of the guns was covered by a roof. The instructor, in most instances, was stationed behind the student. The concussion from a neighboring gun was frequently louder than that from the gun at which the instructor was located.

*Air Range (30 and 50 Calibre Machine Guns):* In aircraft, the students fired from the different types of turrets and from the hand held waist guns. The instructors (air specialists) varied their positions in accord with the constantly changing circumstances. Subjectively, there was a relatively small difference between the noise levels of the aircraft and that of the machine guns. The noise level of the gunfire heard in the plane was perhaps decreased by the presence of an intervening structure, i.e., the skin of the fuselage, and by the carrying off of noise in the slipstream.

Each instructor and student filled out a questionnaire concerning exposure to noise, the use of earplugs and any aural difficulties. In addition to this, a routine examination of all tympanic membranes was performed and the results recorded.

In order to minimize the errors due to the subject's lack of familiarity with the hearing test procedure, each student and instructor was given two complete audiometric examinations, and only the second of these was recorded. The preliminary or indoctrination tests were performed by two enlisted men who had been recently trained for this work. The final audiograms were taken by two trained audiometrists who had had many months of experience in this type of work.

No sound conditioned rooms were available. In order to obtain a satisfactorily low ambient noise level during the testing, it was necessary to take the audiograms in a building

which was some distance from any noise source. Testing during the night hours was the only possible means of avoiding the noise from planes in flight. The ambient noise in the testing rooms varied from 26 to 42 db as measured on a General Radio Sound Level Meter, Type 759-B ("A" weighting). The type of audiometer employed was the Maico D-5 and the two instruments used for the final test had been calibrated just prior to the initiation of the project.

In the study of earplugs as protectors, audiograms were taken on 331 gunnery students at the school of flexible gunnery before the beginning and during the final days of a six weeks' course. Every subject had his ears examined otoscopically and filled out a questionnaire before each of these hearing tests. Sixty-six of the men were asked to act as controls and wear no ear protection during the training period. Each of the remaining students was assigned a specific type of earplug and was requested to wear it whenever he was exposed to the noise of gunfire.

Five types or modifications of earplugs were issued. The students who were to use these plugs were shown how to insert them so that a maximum of hearing protection would be obtained. The plugs may be briefly described as follows:

1. *Sepco Ear Protector*\* consists of a bullet-shaped shell of rubber which is filled with small pieces of airfoam rubber and is sealed at its base by an airfoam rubber stopper. A flange around the shell prevents overinsertion into the ear canal.<sup>8,9</sup>

2. *NDRC V-51 Ear Warden* (Neoprene)† is mushroom-shaped and has a small tab protruding from its base, which facilitates removal from the ear canal.<sup>8,10</sup>

3. *Cotton Twists* are prepared individually from bulk cotton so that they fit snugly in the external canals and the concha of the ears.

4. *Lubricated Cotton Twists* differ from the above only in that the cotton is moistened with a water-soluble jelly.

\*Safety Ear Protector Co., Los Angeles, Calif.

†Psycho-Acoustic Laboratory, Harvard University, Cambridge, Mass.

5. *Lubricated Cotton Rolls* consist of short lengths of three-eighths inch dental rolls coated with water-soluble jelly.

The gunnery students who acted as subjects for this project were members of a single class, and all took the flexible gunnery course during the same six weeks' period. They had been exposed to the noise of gunfire during their basic training, but at least three weeks had elapsed between that exposure and the beginning of this study. The conversational voice hearing test which is required of all gunners had *presumably* eliminated men with gross hearing defects. The subjects ranged from 18 to 36 years of age and the average was 21.9 years.

The routine ear examination revealed that several subjects had aero-otitis media. These were eliminated from this series because of the temporary deafness involved. Cerumen was removed from the ears of the few men who had complete occlusion of the external canal. No other ear conditions were encountered which obviously would affect the validity of comparing the initial and final audiograms.

It has been pointed out above that of the 331 students, 66 were designated as controls. The remaining 265 subjects were divided into five groups according to the type of earplugs employed. Each of these groups will hereafter be designated by the name of the earplug which was used by all of the subjects in that specific group (*i.e.*, the Sepco group, the cotton twists group, etc.).

The selection of subjects to act as controls or to test a particular type of earplug was determined by their order of appearance for the initial hearing test. Quotas for each group had been estimated from the total number of men in the class and these quotas were filled for the control group, and then each successive group. Because of circumstances beyond our control, a comparatively small number were available for testing lubricated cotton rolls. The actual number of subjects in each group who completed the tests is as follows:



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1. Control Group.....	66 subjects
2. Sepco Ear Protector Group.....	61 subjects
3. NDRC V-51R Ear Warden Group.....	58 subjects
4. Cotton Twist Group.....	56 subjects
5. Lubricated Cotton Twist Group .....	61 subjects
6. Lubricated Cotton Rolls Group .....	29 subjects

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The audiograms in this part of the study were taken on the same audiometers, by the same operators and under the same conditions previously described.

It is impossible to evaluate the exact amount of exposure to gunfire which these subjects experienced during the course, for, although they fired in rotation on the same or similar ranges, they were exposed to a variable amount of noise from their own and other men's guns. Each student was supposed to fire a minimum of 600 shotgun shells, 650 50 calibre machine gun shells and 2,400 30 calibre machine gun shells. During the first two weeks most of the firing took place on the shotgun ranges. The next two weeks, 30 and 50 calibre machine guns were fired on the ground ranges, and during the final two weeks either 30 or 50 calibre machine guns were fired from aircraft.

#### RESULTS.

The comparison of the average audiograms of the 187 instructors with that of the 184 students (for both the right and left ears) is shown in Chart 1. A greater high tone loss of hearing among the instructors is indicated by the statistically significant differences which occur at the frequencies 2,048 through 11,584 cps. The losses are more apparent in the left ear and are most marked at and above the 4,096 cps. frequency.

In order to evaluate the detrimental effects of the various types of firing on hearing, seven average audiometric curves were compiled which represent the hearing of the instructors on each type of range. These were compared with the control (students) average audiogram. The data for the right and left



CHART I

COMPARISON OF AVERAGE AUDITORY THRESHOLDS OF GUNNERY INSTRUCTORS WITH GUNNERY STUDENTS

SUBJECTS	NUMBER	FREQUENCIES									
		128	256	512	1024	2048	4096	8192	16384	32768	65536
RIGHT EARS											
Instructors	187	10.0	6.8	8.5	6.9	6.3	25.0	35.3	35.7	30.8	39.4
Students	184	7.3	4.5	6.8	4.9	1.2	14.8	19.8	19.9	15.5	25.7
Difference		2.7	2.3	1.7	2.0	5.1	10.2	15.5	15.8	15.3	13.7
LEFT EARS											
Instructors	187	8.7	5.4	8.5	7.2	8.4	30.6	40.1	37.3	31.1	30.1
Students	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.8
Difference		0.8	1.1	1.7	2.6	6.2	14.0	20.0	19.1	19.6	17.3

NOTE: A statistically significant difference ( $p < .01$ ) is indicated by a line under the difference.

ears were handled separately, and again it was noted that in every instance the hearing differences were slightly more marked in the left ears (see Charts 2 and 3).

It is apparent that the hearing of the air specialists deviates least of all from that of the control group. On the other

CHART 2  
COMPARISON OF AVERAGE THRESHOLDS (IN DECIBELS) OF SEVEN GROUPS OF GUNNERY INSTRUCTORS WITH  
ONE GROUP OF STUDENTS (CONTROL)

SUBJECTS	Number	RIGHT EAR										FREQUENCIES									
		128	256	512	1024	2048	4096	8192	16384	32768	65536	128	256	512	1024	2048	4096	8192	16384	32768	65536
Street instructors	12	13.3	9.0	11.6	12.9	12.5	10.6	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		6.0	5.1	7.0	6.0	11.3	13.2	36.9	30.5	29.2	26.1										
Moving Base Instructors	10	15.5	11.0	11.0	9.0	8.5	30.0	14.0	15.5	14.0	50.5	15.5	11.0	11.0	9.0	8.5	30.0	14.0	15.5	14.0	50.5
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		8.2	6.5	4.2	4.1	7.3	15.2	24.2	25.6	29.2	24.8										
High Tower Instructors	13	12.3	10.0	11.1	8.1	3.1	22.3	18.1	15.8	38.5	16.5	12.3	10.0	11.1	8.1	3.1	22.3	18.1	15.8	38.5	16.5
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		5.0	5.5	4.3	3.2	1.9	7.5	28.3	25.2	23.0	20.8										
Malfunction #1 Instructors	14	8.6	7.9	9.6	6.8	2.5	21.1	31.2	37.9	32.9	104.9	8.6	7.9	9.6	6.8	2.5	21.1	31.2	37.9	32.9	104.9
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		2.3	3.4	2.8	1.9	1.3	6.6	11.4	18.0	17.4	79.2										
Malfunction #2 Instructors	22	13.0	8.9	11.6	11.6	15.7	31.0	36.6	36.9	31.6	104.1	13.0	8.9	11.6	11.6	15.7	31.0	36.6	36.9	31.6	104.1
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		5.7	4.4	4.8	6.7	14.5	16.2	16.8	19.0	16.1	78.4										
Ground Range Instructors	67	8.4	4.9	7.0	5.5	5.7	25.3	35.4	35.3	29.9	37.7	8.4	4.9	7.0	5.5	5.7	25.3	35.4	35.3	29.9	37.7
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		1.1	0.4	0.2	0.6	4.5	10.5	15.6	16.4	14.1	12.0										
Air Specialists	19	8.5	5.9	5.8	3.7	3.7	15.9	24.9	24.6	22.7	32.1	8.5	5.9	5.8	3.7	3.7	15.9	24.9	24.6	22.7	32.1
Students (Control)	184	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7	7.3	4.5	6.8	4.9	1.2	14.6	19.6	19.9	15.0	25.7
Difference		1.2	1.4	-1.0	-1.2	1.5	1.1	5.1	4.7	7.2	6.6										

NOTE: A statistically significant difference ( $P < .01$ ) is indicated by a line under the difference.

hand, the skeet range instructors have the most marked hearing loss. The other men who were exposed to shotgun fire (moving base and hightower) also show a loss of hearing for high tones which apparently exceeds the amount incurred by the instructors on the ground, malfunction and air ranges. It

CHART 3

COMPARISON OF AVERAGE THRESHOLDS ( IN DECIBELS) OF SEVEN GROUPS OF GUNNERY INSTRUCTORS  
WITH ONE GROUP OF GUNNERY STUDENTS (CONTROL)

SUBJECTS	Number	FREQUENCIES									
		128	256	512	1024	2048	4096	8192	16384	32768	65536
SHEET INSTRUCTORS	12	9.2	3.8	6.8	8.3	13.6	52.9	66.7	56.3	54.6	56.3
Students (Control)	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.6
Difference		1.3	-0.5	2.0	3.7	11.6	36.3	46.6	38.1	43.1	35.5
MOVING BASE INSTRUCTORS	10	16.0	11.0	11.5	15.5	15.5	51.0	60.0	55.5	52.0	66.5
Students (Control)	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.6
Difference		8.1	6.7	4.7	10.9	13.3	34.4	39.9	36.3	40.5	45.9
HIGH TOWER INSTRUCTORS	13	10.8	6.5	15.4	13.5	13.1	36.9	47.7	41.2	40.4	46.9
Students (Control)	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.6
Difference		2.9	2.2	8.6	8.9	10.9	20.3	27.6	23.0	28.9	26.3
VALUFUNCTION #1 INSTRUCTORS	14	6.2	5.4	7.9	4.6	5.4	18.9	14.6	39.3	35.7	44.3
Students (Control)	184	0.3	1.1	1.1	0.0	3.2	2.3	11.7	21.1	20.2	23.5
Difference		5.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.8
VALUFUNCTION #2 INSTRUCTORS	22	11.1	9.5	12.3	11.8	16.4	34.3	45.5	37.0	31.1	35.5
Students (Control)	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.6
Difference		3.2	5.2	5.5	7.2	14.2	17.7	25.4	18.8	19.6	14.9
GROUND RANGE INSTRUCTORS	67	6.1	4.6	7.5	5.6	6.2	28.7	37.8	38.8	28.1	34.5
Students (Control)	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.6
Difference		0.2	0.3	0.7	1.0	4.0	12.1	17.7	20.6	16.6	13.9
AIR SPECIALISTS	49	6.2	3.5	5.4	4.3	4.6	23.5	30.7	25.4	21.4	29.8
Students (Control)	184	7.9	4.3	6.8	4.6	2.2	16.6	20.1	18.2	11.5	20.6
Difference		-1.7	-0.8	-1.4	-0.3	2.4	6.9	10.6	7.2	9.9	9.0

NOTE: A statistically significant difference ( $P < .01$ ) is indicated by a line under the difference.

may be stated that the average hearing curves for the instructors on each of the ranges show decided losses of hearing for the higher tones and that, with the exception of the air specialists, there is a statistically significant difference between many of these losses and those of the control group.

CHART 4.  
COMPARISON OF AVERAGE AUDITORY THRESHOLDS OF GUNNERY INSTRUCTORS WITH GUNNERY STUDENTS BY AGE GROUP

Age Group	Subjects	Number	FREQUENCIES									
			128	256	512	1024	2048	2896	4096	5792	8192	11584
RIGHT EARS 18-20 yrs.	Instructors	26	8.1	5.2	5.6	4.4	1.9	17.5	33.3	31.7	25.8	28.6
	Students	150	7.1	4.0	5.8	3.8	0.2	13.1	19.4	14.0	23.4	23.4
	Difference		1.0	1.2	-0.2	0.5	1.7	4.4	14.1	17.7	11.8	5.4
21-23 yrs.	Instructors	75	10.2	6.6	7.9	6.9	6.2	14.2	35.8	37.1	33.1	34.2
	Students	89	6.6	4.4	5.7	4.0	0.9	12.9	18.0	14.1	23.6	23.6
	Difference		3.6	2.2	2.2	2.9	5.3	1.3	22.9	23.0	18.9	11.4
24-26 yrs.	Instructors	38	7.8	5.0	6.3	4.9	5.8	8.5	32.2	34.6	30.4	32.2
	Students	62	6.7	4.0	6.6	3.9	0.8	16.9	23.3	21.7	17.3	26.1
	Difference		1.1	1.0	-0.3	1.0	5.0	-8.3	6.9	12.9	13.1	11.1
27-29 yrs.	Instructors	29	11.0	11.0	15.0	11.9	8.6	10.2	34.8	31.7	26.7	34.0
	Students	19	9.7	5.8	7.1	6.8	2.6	12.6	15.5	22.1	16.6	22.6
	Difference		1.3	5.2	7.9	5.1	6.0	-2.4	19.2	9.6	10.1	18.4
LEFT EARS 18-20 yrs.	Instructors	26	7.1	3.3	6.9	4.8	1.9	16.5	31.9	33.9	24.2	31.0
	Students	150	7.5	4.2	6.1	4.1	1.1	14.2	17.8	16.6	10.1	16.6
	Difference		-0.4	-0.9	0.8	0.7	0.8	2.3	14.1	17.3	14.1	14.4
21-23 yrs.	Instructors	75	9.3	6.4	8.1	6.1	6.1	12.7	38.7	38.7	31.5	32.5
	Students	89	7.6	4.3	6.3	4.2	2.4	16.1	21.7	19.3	12.1	19.7
	Difference		1.7	2.1	1.8	1.9	3.7	7.6	17.0	19.4	19.4	12.8
24-26 yrs.	Instructors	38	6.7	3.3	5.9	4.2	5.9	29.3	38.8	38.0	30.1	34.2
	Students	62	6.7	2.5	5.2	3.0	1.3	17.3	23.0	18.9	13.7	23.6
	Difference		0.0	0.8	0.7	1.2	4.6	12.0	15.8	19.1	16.4	10.6
27-29 yrs.	Instructors	29	10.3	6.7	11.7	10.5	8.6	28.5	37.8	31.9	26.5	34.4
	Students	19	8.9	4.7	6.6	4.2	2.1	14.7	18.1	12.4	21.8	21.8
	Difference		1.4	2.0	5.1	6.3	6.5	13.8	19.7	19.5	14.7	12.6

NOTE: A statistically significant difference ( $P < .01$ ) is indicated by a line under the difference.

The comparison of average auditory thresholds of instructors with students by age groups is shown on Chart 4.\* It is apparent that there was a predominance of students in the

\*Since it was recognized that the older average age of the instructors might play an important rôle in the production of greater average hearing losses and the number of students in the older age group was not sufficient to provide a valid comparison, the audiograms of 136 additional students were used in making an analysis of the age factor. These students were comparable with the original group and audiograms were taken under the same conditions.

youngest group (18-20 years) and of instructors in the oldest group (27-29 years). The least number of significant differences between the average audiograms of the students and instructors occur in the oldest and youngest age groups, while the greatest number occur in the 21-23 years of age group. There is no regular progression of hearing losses for the high tones in the progressively older groups of either students or instructors.

The 11 subjects who were followed with repeated audiograms during a recovery period of two weeks were initially tested one-half to two hours after they had ceased firing. Subsequent audiograms were taken at the end of 24 hours, 48 hours and two weeks. The average audiograms for these recovery periods are shown in Fig. 1. Despite the fact that these hearing tests do not show a uniformly progressive recovery, it would appear that the major portion of temporary high tone hearing loss had disappeared within 24 to 48 hours after the last exposure to gunfire noise.

HEARING RECOVERY—AVERAGE AUDIOGRAMS OF LEFT EARS  
(11 Subjects).

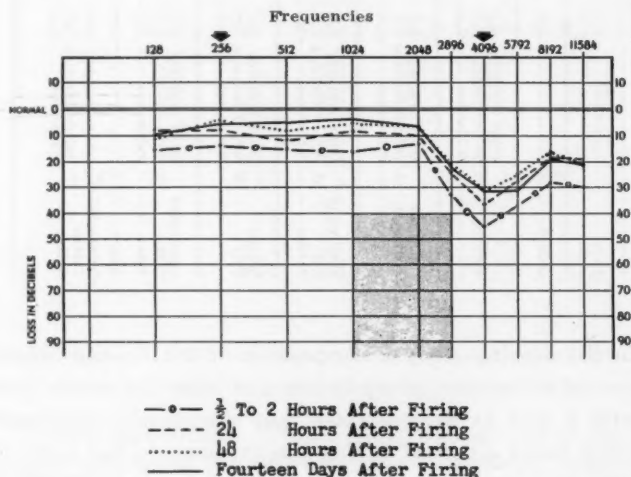


Fig. 1.

CHART 5  
AVERAGE AUDIOMETRIC HEARING CHANGES DURING GUNNERY TRAINING IN DECIBELS  
LEFT EARS

GROUPS	NO. EARS	FREQUENCIES									
		128	256	512	1024	2048	2896	4096	5792	8192	11584
Control	After Training	8.0	4.6	6.1	4.7	4.3	20.7	28.0	25.2	18.6	25.8
	66 Before Training	8.3	4.7	6.5	3.8	2.1	15.2	18.9	16.4	11.8	20.5
	Difference	-0.3	-0.1	-0.4	0.9	2.2	5.5	9.1	8.8	6.8	5.3
Sapco Ear Protector	After Training	6.5	3.1	4.5	3.0	1.6	15.0	20.2	19.5	13.6	19.7
	61 Before Training	7.1	3.5	6.2	3.9	1.3	14.5	18.5	17.5	10.3	19.7
	Difference	-0.6	-0.4	-1.6	-0.9	0.3	0.5	1.7	2.0	3.3	0.0
NIBC V-5LR Ear Warden	After Training	6.6	3.2	5.6	4.1	1.3	14.0	19.8	16.8	12.9	19.1
	58 Before Training	6.4	3.0	5.9	4.0	1.5	15.6	19.3	16.8	10.7	21.0
	Difference	0.2	0.2	-0.3	0.1	-0.2	-1.6	0.5	0.0	2.2	-1.9
Cotton Twist	After Training	7.5	4.8	6.2	5.2	4.9	19.7	24.1	23.8	17.5	20.7
	56 Before Training	8.6	4.6	7.1	5.2	3.5	18.4	22.6	20.3	11.7	17.9
	Difference	-1.1	0.2	-0.9	0.0	1.4	1.3	1.5	3.5	5.8	2.8
Lubricated Cotton Twist	After Training	7.3	4.3	5.7	4.0	0.9	14.3	23.1	19.5	14.6	17.2
	61 Before Training	6.9	3.4	4.8	3.5	0.7	14.2	21.4	19.1	11.9	16.0
	Difference	0.4	0.9	0.9	0.5	0.2	0.1	1.7	0.4	2.9	1.2
Lubricated Cotton Balls	After Training	7.2	3.5	6.4	4.3	0.5	16.6	26.7	22.1	18.8	25.2
	29 Before Training	7.8	4.8	6.4	3.8	0.3	16.7	21.9	19.6	15.2	23.2
	Difference	-0.6	-1.3	0.0	0.5	0.2	-0.1	4.8	2.5	3.6	2.0

NOTE: A Statistically significant difference ( $P < .01$ ) is indicated by a line under the difference.

In the earplug study a comparison of the average audiograms of the control group before and after the course (see Charts 5 and 6) demonstrates that statistically significant hearing losses occurred during the exposure to the noise of gunfire and were produced in the higher frequencies (2,896 to

CHART 6  
 AVERAGE AUDIOMETRIC HEARING CHANGES DURING GUNFIRE TRAINING IN DECIBELS  
 RIGHT EARS

GROUPS	NO. EARS	FREQUENCIES									
		128	256	512	1024	2048	2896	4096	5792	8192	11584
Control	66 After Training	6.9	4.1	5.8	4.0	0.8	16.7	24.9	25.3	21.4	29.9
	Before Training	7.8	4.4	6.1	3.7	-0.6	13.6	19.5	20.8	15.5	24.6
	Difference	-0.9	-0.3	-0.3	0.3	1.4	3.1	5.4	4.5	5.9	5.3
Sepco 61 Protector	After Training	10.2	5.1	6.6	4.1	2.1	16.4	19.7	22.6	17.5	29.6
	Before Training	6.4	3.9	6.2	2.5	-0.7	17.3	19.8	20.5	15.7	28.8
	Difference	3.8	1.2	0.4	1.6	2.8	-0.9	-0.1	2.1	1.8	0.8
MDEG V-51R Ear Marden	After Training	6.6	3.4	5.9	5.9	1.9	16.0	22.5	21.6	16.7	24.7
	Before Training	6.3	4.1	6.6	5.1	2.2	15.3	21.1	20.3	18.5	27.1
	Difference	0.3	-0.7	-0.7	0.8	-0.3	0.7	1.4	1.3	-1.8	-2.4
Cotton Twist	After Training	7.9	4.6	5.8	4.8	2.9	18.8	22.8	22.9	17.8	26.2
	Before Training	7.3	4.6	6.8	5.9	2.2	16.4	20.1	20.0	13.8	25.9
	Difference	0.6	0.0	-1.0	-1.1	0.7	2.4	2.7	2.9	4.0	0.3
Lubricated Cotton Twist	After Training	11.6	6.5	7.5	6.5	2.3	17.2	24.3	22.5	18.7	26.6
	Before Training	6.9	3.6	3.9	3.7	1.2	14.8	23.9	23.8	19.5	27.2
	Difference	4.7	2.9	3.6	2.8	1.1	2.4	0.4	-1.3	-0.8	-0.6
Lubricated Cotton Rolls	After Training	7.8	4.0	4.5	2.9	0.9	17.2	22.2	15.3	14.8	21.9
	Before Training	8.1	5.5	4.9	4.8	0.5	15.0	22.2	19.3	11.6	22.2
	Difference	-0.3	-1.5	-2.4	-1.9	0.4	2.2	0.0	-1.0	3.2	-0.3

 NOTE: A statistically significant difference ( $P < .01$ ) is indicated by a line under the difference.

11,584 cps.). In amount these losses range from about 3 to 9 db and are somewhat more marked in the left ears.

Similar comparisons of the average audiograms of the five groups who tested the different types of earplugs reveal only one statistically significant loss (see Charts 5 and 6). This

appears at the 8,192 cps. frequency in the left ears of the subjects who wore Sepco earplugs, and is considered to be a possible chance variation.

#### DISCUSSION.

Since no audiograms had been taken on the instructors prior to their entrance into the gunnery course, it was necessary to use a control group composed of students who were about to enter gunnery training. It is believed that the mean hearing of these students may be considered grossly comparable to the average hearing of these instructors prior to their entrance into training, in that the members of both groups had been exposed to gunfire noise of basic training and had subsequently passed the same conversational voice hearing tests.

It is difficult to draw conclusions concerning the influence that age may have played in the very apparent differences between the mean audiograms of students and instructors (see Chart 1). For example, there is no adequate explanation for the small number of significant differences in hearing in the youngest and oldest groups and the preponderance of these differences in the 21-23 years of age group (see Chart 4). It would appear from previous studies<sup>5,6</sup> that the small mean age difference (two and one-half years) that exists between the students and instructors would hardly account for a great amount of the discrepancy between these average audiograms. This assumption is supported by the fact that there is no regular increase of hearing loss in the progressively older groups of either students or instructors (see Chart 4).

As pointed out previously, the student hearing tests were taken after a recovery period of at least three weeks, but the instructors were tested three to 48 hours after they had last fired. The temporary hearing loss which must have been present in this latter group composes at least a part of the comparative differences between the average audiogram of the students and that of the instructors (see Chart 1). The



exact amount of this temporary hearing loss cannot be determined, but there are certain factors which may aid in a gross evaluation. The audiograms of 106 instructors who were tested after a recovery period of from 24 to 48 hours should include only a small amount of temporary hearing loss, for it was shown on a small control series (see Fig. 1) that the major portion of high tone hearing recovery took place within a period of 24 to 48 hours. The remaining 81 instructors were tested from three to six hours after firing and undoubtedly their audiograms show a greater amount of temporary loss.

It has been pointed out that the air specialists demonstrated less average hearing loss than any of the groups of instructors from the other ranges (see Charts 2 and 3). This may indicate that the high intensity of ambient aircraft noise causes a muscular splinting of the sound conducting mechanism in the middle ear which partially protects the cochlea against the relatively greater intensity of gunfire noise.

Despite the fact that the instructors on the skeet, moving base and hightower ranges had a 24 to 48 hour recovery period before being tested, their average audiograms show more marked hearing losses than any of the other instructor groups (see Charts 2 and 3). The explanation for this would seem to be that the noise of shotgun firing was not sufficiently intense to cause marked aural discomfort and, therefore, did not force the instructors to wear ear protection.

The fact that the group of subjects who wore ear protection in the study of earplugs incurred insignificant average hearing losses while the control group incurred significant losses would infer that any one of these five types of earplugs is capable of affording adequate protection against the amount of noise encountered in such a flexible gunnery course; however, it is possible that the small hearing losses might have become significantly larger in any or all of these groups if the duration of exposure to, or the intensity of, the gunfire noise had been markedly increased.

Since a longer or shorter final recovery period for the majority of subjects in any one group might have diminished

CHART 7

NUMBER OF SUBJECTS IN EACH GROUP TESTED ONE, TWO, OR THREE DAYS AFTER FIRING

RECOVERY PERIOD	NUMBER OF SUBJECTS				
	CONTROL GROUP	SEPCO GROUP	NDRC V-5LR EAR WARDEN GROUP	COTTON TWIST GROUP	LUBRICATED COTTON TWIST GROUP
ONE DAY	34	29	43	39	14
TWO DAYS	27	29	15	12	13
THREE DAYS	5	3	0	5	4
					11
					18
					0

or increased the average hearing loss for that group and since a single uniform recovery period was not permitted all the subjects before their final audiometric examination, the number of students in each group who were tested one, two or three days after firing must be considered. Inspection of Chart 7 reveals that the number of men in each group who

were tested after any one of these three recovery periods are not proportionately comparable for all groups. The following however, should be pointed out. The control group was the only one which showed significant hearing losses (see Charts 5 and 6) and approximately half of the men comprising this group were tested two or three days after firing. On the other hand, the NDRC V-51R Ear Warden, cotton twist, lubricated cotton twist and Sepco groups did not show significant hearing losses, although well over 50 per cent of the subjects in each of the first three groups and almost half of the subjects in the Sepco group were permitted a recovery period of only one day. There is no doubt that the longer period (two days) for approximately 60 per cent of the students in the lubricated cotton rolls group may have reduced the average hearing losses in this group.

The questionnaires revealed that almost all of the controls were forced by discomfort to wear cotton in their ears on one exceedingly noisy range where 50 calibre machine guns were fired from beneath sheds. The use of this protection probably reduced the magnitude of the average hearing losses in this group but the exact amount cannot be estimated.

It was hoped that the results of this project would demonstrate the relative protection afforded by each of the five types of earplugs but, obviously, the hearing losses were not of sufficient magnitude to permit significant differentiation.

#### CONCLUSIONS.

a. The noise of gunfire (50 calibre machine gun and shot-gun) produced a definite loss of hearing for high tones (2,048-11,584 cps.) among gunnery instructors (see Chart 1).

b. A major portion of the temporary high tone hearing loss which is present immediately after exposure to the noise of gunfire is recovered in the subsequent 24 to 48 hours (see Fig. 1).

c. Significant high tone (2,896-11,584 cps.) hearing losses (3 to 9 db) were produced in the average audiograms of a

group of students who almost never wore ear protection during a six weeks' course in flexible gunnery (see Charts 5 and 6).

d. The groups of students who wore one of five types of earplugs (Sepco Ear Protectors, NDRC V-51R Ear Warden, cotton twists, lubricated cotton twists, lubricated cotton rolls) incurred, with one minor exception, nonsignificant average hearing losses during the course (see Charts 5 and 6).

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## REVIEW OF THE AVAILABLE LITERATURE OF THE PHARYNX AND PHARYNGEAL SURGERY FOR 1949.

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### ANATOMY.

Wilkerson and Cayce<sup>1</sup> present what they believe to be the first report of a craniopharyngeal canal in a living person. They give an excellent review of the literature. The embryology and anatomic description of the canal are considered, and there is a brief discussion of craniopharyngiomas, their pathology and treatment. It is interesting to note that the persistent craniopharyngeal canal in their patient was discovered incidentally during an operation for bony canal occlusion.

### PATHOLOGY.

Because the nasopharynx has long been a neglected structure in the medical literature, Hollender<sup>2</sup> and Szanto undertook a pathologic study of 140 nasopharynges obtained at necropsy. From this study they concluded that not only is the nasopharynx affected by certain diseases more often than is generally appreciated but that it is also frequently the focal source of systemic diseases generally believed to be of obscure etiology.

The nasopharynx is defined as "the uppermost division of the pharynx, situated behind the nose and above the level of the soft palate." Unlike that of the oropharynx and hypopharynx, its cavity is always patent. Because of improved

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facilities, examination of the nasopharynx has become sufficiently simple to enable the general practitioner to diagnose diseases formerly considered obscure. Inflammation of the nasopharynx is a common condition which, in its acute form, may be responsible for acute infections of the respiratory tract, and, in its chronic form, may act as a source of infection in chronic disease. Among diseases of the nasopharynx not readily suspected or diagnosed, Hollender includes lymphohyperplasia, tuberculosis, pharyngeal bursitis and nasopharyngeal cysts. Now available for the control and cure of nasopharyngeal diseases are chemotherapeutic and antibiotic agents, radiation and surgical procedures.

#### BACTERIOLOGY.

Enders<sup>3</sup> briefly reviews those viruses pathogenic for man which may be present in the mouth, pharynx or adjacent structures. He states that although the poliomyelitis virus has been isolated from the tonsil, proliferation at this site has not been demonstrated. He believes that certain cases of otitis media in which the effusion is bacteriologically sterile may be due to viral infection. He discusses "acute herpetic gingivostomatitis" which is due to the virus of herpes simplex. This condition may be diagnosed by the clinical picture and positive reaction to the serologic test. Stomatitis associated with diarrhea in infants is believed to be due to a virus. There are characteristic vesicles in the mouth. Enders points out that in cases of deafness in which the diagnosis is not clear and there is a possibility of the patient having had mumps in the past, the complement fixation or skin tests for mumps may be of diagnostic importance.

Miller and Bohnhoff<sup>4</sup> took throat cultures from a large series of patients receiving streptomycin in doses from 1 to 4 gm. daily. They found that streptomycin-resistant bacteria appeared among the normal flora after one or two weeks of streptomycin therapy. The organisms recovered were those usually found in the normal human throat except that a large number of yeasts was present. Penicillin, sulfonamides, or

both, had no effect upon the development of streptomycin-resistant organisms. In a control series of patients not receiving streptomycin only small numbers of resistant organisms were found.

The Commission on Acute Respiratory Diseases<sup>5</sup> made a study on 74 subjects to compare the results of pharyngeal cultures with those of nasopharyngeal cultures when each was made in the same manner from swabs taken simultaneously from the same individual. Their data revealed that *S. aureus*, *H. influenzae* and pneumococci are often present in nasopharyngeal cultures when they are not demonstrable in pharyngeal cultures. They, therefore, point out that in order to determine the presence of these three organisms in the upper respiratory tract nasopharyngeal cultures should be used as well as pharyngeal cultures. Their results showed no superiority of either culture in regard to beta hemolytic streptococci and *H. hemolyticus*.

Although no observations were recorded in regard to the suggestions that nasopharyngeal cultures contained fewer "extraneous" and interfering organisms, the impression was gained that under the conditions of the study this feature was not outstanding. This study did not confirm the hypothesis that repeated nasopharyngeal cultures taken on a single subject give more consistent results than the pharyngeal cultures. They question the reliability of data on the bacterial flora of the upper respiratory tract which are based on the results of one or even two pharyngeal or nasopharyngeal cultures, since there were inconsistencies and errors in their results of repeated cultures taken from both areas.

Pelczar, Hajeck and Fabér<sup>6</sup> made an attempt to isolate additional strains from the bacterial flora of the pharyngeal region of normal guinea pigs for purposes of supplementing a collection of neisseria currently under investigation from the standpoint of systematics. In this particular report these authors describe a group of Gram-negative diplococci isolated from the pharyngeal area of guinea pigs. It is of considerable interest to note that none of the currently recognized species

of neisseria have been reported as isolated from animals. Their method of obtaining the cultures is described and a study of the various characteristics tabulated.

#### DISEASES.

Rubin<sup>7</sup> points out that the nasopharynx is a definite anatomic region containing lymphoid tissue which is known as the adenoid. The latter may become acutely infected just as the tonsils or the pharyngeal lymphoid tissue. Such infection produces varying degrees of malaise and sore throat, symptoms for which a cause may be difficult to find unless the nasopharynx is examined. This condition represents true acute pharyngitis. Rubin thinks that the latter term is too often used indiscriminately to refer to unidentified inflammation of the upper respiratory tract and should be reserved for specific infections of the nasopharynx itself.

Zak and Cisneros<sup>8</sup> describe what they believe to be the first case of psoriasis of the hypopharynx to be reported in the literature. The lesion was discovered at necropsy following death from massive pulmonary embolization in a man 60 years old who died three weeks after craniotomy for removal of a supracellar meningioma. At necropsy, psoriatic lesions were noted on the left forearm and the wall of the hypopharynx. The section from the hypopharyngeal lesion revealed a large degree of accumulation and desquamation of nucleated squamous epithelial cells analogous to the parakeratosis of cutaneous psoriasis accompanied by a focal disturbance of the stratified epithelium. There was also a conspicuous accumulation of amorphous eosinophilic material in the submucosa. The absence of the usual psoriatic acanthosis is explained by the authors by the fact that the normally scant papillae of this region were flattened out and obliterated by this edematous infiltration. The edematous infiltration contained collagen and elastin bundles spread widely apart.

The Bremonds<sup>9</sup> report the case of a woman, 42 years old, who complained of pain, of five years' duration, in the left side of the pharynx in the tonsillar region, radiating toward



the ear, maxilla and submaxillary region on the same side. The left tonsil was slightly enlarged; palpation of the anterior wall of the tonsillar bed was painful and revealed a hard body. The pain was completely relieved by removal of a portion of the stylohyoid ligament, which had undergone ossification.

Phelps and associates<sup>10</sup> report the results of a detailed study, from the standpoint of clinical and laboratory observations and response to three kinds of treatment, of 272 consecutive cases of streptococcal pharyngitis encountered at a large Air Force station hospital during a 19-day period. Throat cultures positive for streptococcal hemolyticus were obtained in 89.3 per cent of the series. Complications occurred in 14.3 per cent of the series. Penicillin was found to be more effective than sulfadiazine or symptomatic treatment, although sulfadiazine, like penicillin, shortened the period of hospitalization, hastened subsidence of edema and redness, and reduced the number of complications.

Swanston<sup>11</sup> presents a case of ocular pemphigus in a woman 80 years old. Incident and concomitant findings were bilateral epistaxis from Kiesselbach's plexus and nonspecific ulcers of the tonsillar pillars, epiglottis and arytenoids.

Kelley<sup>12</sup> presents a discussion of 10 consecutive cases of oral and pharyngeal inflammation in adults with *Monilia albicans* isolated as the only or the predominant organism. These patients were successfully treated by local applications of gentian violet and large doses of vitamin B complex orally for periods of one to 10 months with an average of 3.5 months. Contrary to the reports in the literature, the most conspicuous feature of these cases was the frequent association of "white furry" patches with "black furry" patches. Kelley believes that because of the common causative agent and the uniformly successful treatment there may be justification for considering these furry patches of all hues between white and black as belonging to the same clinical entity.

In an excellent article well worth reading in its original form, Davidson<sup>13</sup> calls attention to the fact that whereas numerous cases of abscesses of the retropharyngeal spaces

have been reported in children, only 114 cases in adults have been reported in the literature. He reports eight additional cases from the records of Barnes Hospital — an incidence of one in 11,659 hospital admissions. He states that there are four potential spaces behind the pharynx; two peripharyngeal spaces extending from the carotid sheath on each side to the cricoid below and the upper border of the superior constriction above. They are divided in the midline by a fibrous septum. The postvisceral space lies between the prevertebral muscles and the peripharyngeal space and extends below into the posterior mediastinum. The prevertebral space exists between the vertebral and the prevertebral fascia. There are lymph nodes in the peripharyngeal space in children which are not usually present in adults. This is believed by some to account for the uncommon occurrence of abscesses of these spaces in adults.

Abscess of the prevertebral space is most commonly associated with tuberculosis of the cervical spine.

The commonest causes of abscesses of the retropharyngeal spaces are otitis and mastoiditis. Many possible methods by which otogenic pharyngeal abscesses are produced are discussed. Contrary to common belief, abscess of the retropharyngeal spaces is rarely due to foreign bodies. These abscesses are diagnosed by the history of dysphagia, pain in the throat, and dyspnea, and by the observation of a mass protruding from the posterior pharyngeal wall. The importance of a lateral Roentgenogram of the cervical spine must not be overlooked. The commonest complications of these abscesses are mediastinitis and hemorrhage from one of the larger vessels of the neck. The treatment consists in incision and drainage. There is a difference of opinion whether they should be drained externally or through the pharynx. Many reserve the external approach for those cases which are too low or too lateral for internal drainage. Two cases are reported.

Woodruff<sup>14</sup> discusses epistaxis and gives a brief analysis of 28 cases. He differentiates between bleeding from Kiessel-

bach's plexus (epistaxis digitorum) and bleeding from other areas of the nose which are associated with hypertensive cardiovascular disease; these he calls cardiovascular epistaxis. He has noted that in many of these patients the bleeding point is located posteriorly in the inferior meatus. He has observed dilated blood vessels in the posterior portion of the inferior meatus and the lateral nasopharyngeal wall which he calls the nasopharyngeal plexus. He advocates electrocoagulation of the bleeding point if accessible and tamponage with cotton tampons soaked in a mixture of tannic acid and antipyrine solutions when the bleeding point is not accessible. It was necessary to ligate the external carotid in four of his patients in order to control the hemorrhage; in three of these a septal deflection prevented adequate packing.

#### DIVERTICULA.

McNealy and Glassman<sup>15</sup> advocate two-stage pharyngoesophageal diverticulectomy for large diverticula which distort the structure from which it originates, and also for diverticula complicated by inflammation, ulceration and perforation. The first stage consists of freeing the sac, bringing it out laterally and performing a diverticulopexy. After two weeks or more, the second stage, resection of the sac, is performed. The technique of resection is described and illustrated and details of preoperative and postoperative care are given. McNealy and Glassman have never found it necessary to dilate the esophagus following diverticulectomy. They attribute this primarily to the transverse character of the resection and to the use of interrupted sutures of nontraumatized or crushed structures.

Blain<sup>16</sup> discusses the pathogenesis, complications, incidence and technique of surgical excision of pharyngoesophageal diverticula. He points out that these diverticula may now be safely removed in one stage unless the sac is extremely large. In the latter cases it is safer to correct the condition by a two-stage procedure because of the danger of infection in the widely open fascial planes of the neck and mediastinum. The two-stage operation allows time for walling off of these spaces

by fibrinous exudate. Several cases are reported to illustrate the varied types of pharyngoesophageal diverticula and the necessity of selecting the procedure best suited to the specific case.

Rivas Diaz<sup>17</sup> reports a case of successful removal of a large pharyngoesophageal diverticulum in a female. The diverticulum caused the patient to have extreme difficulty on swallowing. The interesting feature of this case is the large size of the sac.

Waldapfel<sup>18</sup> reports two cases of patients with pharyngoesophageal diverticula whose symptoms were eliminated by dislocation of the sac. In the first case the sac was dislocated at the first stage and at a second stage it was resected. The second patient was treated by the one-stage procedure. Since symptoms were relieved in both cases, Waldapfel is of the opinion that in small and medium sized sacs, as well as some large ones, dislocation of the sac is sufficient. It is a safe procedure, easy to perform, causes minimal discomfort and short convalescence, and provides immediate postoperative normal feedings. If it is found that the sac needs to be resected, this can always be done at a later date. Waldapfel calls attention to the fact that resecting the sac does not always insure against recurrence. In his first case, despite resection, a new sac formed four years later.

Mino and associates<sup>19</sup> report a case of pharyngoesophageal diverticula of unusual size in a Negro 62 years old. They found no previous record of a larger diverticula of this type, and they know of no reported instance of a case with coexisting compression of the lungs. The patient sought medical attention because of weakness and dysphagia of about six months' duration. Roentgenograms revealed an enlarged oval mass lying in the mediastinum and upper part of the chest on the right. Its superior and inferior poles were opposite the first and sixth thoracic vertebrae, respectively. The lateral border of the mass was about 9 cm. from the midline of the chest, encroaching upon the pleural cavity and compressing the lung on the right side. Anteroposteriorly the mass was

almost centrally located. Preliminary jejunostomy resulted in a gain of 26 pounds within three weeks. The diverticulum was removed in two stages because of its size. In the first stage the diverticulum was exposed through an incision beginning at the anterior edge of the right sternocleidomastoid muscle and extending from the sternum to the level of the hyoid bone. It was difficult to mobilize the diverticulum because of excessive adhesions. Dissection was facilitated by intermittent air injections through the lavaging tube. The diverticulum was implanted in the wound in a position which assured an obtuse angle at the junction of its neck with the esophagus. The second stage was performed 10 days after the first, at which time the diverticulum was excised and the esophageal orifice was closed. Roentgenograms nine months post-operatively revealed no abnormality of the pharynx, hypopharynx and esophagus.

In contradistinction to the current theory of a congenital weakness of the posterior pharyngeal wall, which fails to explain why pharyngoesophageal diverticula do not occur in children and are commoner in men than women, Horowitz<sup>20</sup> suggests that an acquired defect may account for the herniation. In support of this view is the fact that its occurrence in young persons has never been reported except for cases with organic stenosis of the upper end of the esophagus. Evidence is presented in support of King's concept that the presence of the lower end of the cricoid cartilage against the spine has a causative relationship in the development of these diverticula. This would explain why these diverticula occur more often in men, since their larynges are larger than women's and would be more firmly in contact with the spine, because men are more muscular than women. A fatal case of a perforated diverticulum in a woman 72 years old is described.

Shallow,<sup>21</sup> who advocates combined one-stage pharyngeal diverticulectomy, presents an analysis of 204 consecutive personal cases in which this method was employed. The salient features of the method consist in: 1. cleansing and emptying the sac through the esophagoscope; and 2. keeping the esophagoscope in the esophagus while the neck of the sac is being

ligated, its stump transplanted and the pharynx repaired; this will maintain the normal anatomic position of the pharynx and upper part of the esophagus, a factor which favors normal function after healing has occurred. Esophagoscopy assists in cleansing of the sac from within, making the sac easy to identify, and prevents the development of stenosis and angulation at the site of repair. Attention is called to the necessity of meticulous repair of the pharyngeal wall. Shallow advocates anchoring the posterior portion of the suture line to the prevertebral fascia "because it strengthens the repair, obliterates the retropharyngeal space at this point, and erects a barrier against descending infection into the mediastinum." Shallow believes that the safety and efficacy of this method has been proved by the fact that in his series there were no cases of mediastinitis, there was only one recurrence and the mortality rate was 2.5 per cent in an age group averaging 60 years.

#### IRRADIATION.

Pool and associates<sup>22</sup> report their results in 150 patients with nasopharyngeal lymphoid hyperplasia and 20 patients with asthma treated during the war years with Roentgen-ray. Follow-up data were received from 72 per cent of the 170 cases; 34 per cent of these obtained some relief, 43 per cent were greatly improved, and 33 per cent obtained no relief. Several patients with asthma obtained remarkable relief following treatment with Roentgen-ray but they were receiving allergic treatment at the same time. There were no serious ill effects from the irradiation treatment. Of 20 children who received irradiation therapy for lymphoid hypertrophy, middle ear infection and deafness during the same period, 27 per cent greatly improved, 33 per cent received some benefit and 40 per cent were unimproved. The conclusion is drawn that "before the real value of irradiation as a therapeutic agent in allergic disorders can be determined, many more cases must be studied."

In a most excellent article on the treatment of infections of the upper respiratory tract, Proctor, Polvogt and Crowe<sup>23</sup> divide their discussion into three parts. They first discuss the physiologic functions of the upper respiratory tract by describing in minute detail the nasal mucosa, ciliary functions and lymphoid significance. The pathology of the upper respiratory tract is then discussed in considerable detail and irradiation of adenoids is described.

Results obtained by them have been highly beneficial. It must be clearly understood that irradiation of the nasopharynx with a radium applicator is no panacea, but in selected cases it is an invaluable therapeutic measure. Their technique of application as well as clinical indications is described. A report of the results obtained in competent hands emphasizes the tremendous value of adequate therapy properly applied. An important phase of this work is the chapter on the prevention of deafness in children.

This is by far the best article published recently on this subject and should be read by all interested in lymphoid hyperplasia of the nasopharynx.

In a study of the literature in the treatment of lymphoid tissue in the nasopharynx, Rius<sup>24</sup> found that 25,000 radium treatments were administered during World War II in an effort to control recurring aerotitis and infections of the nasopharynx with 90 per cent successful results. Rius discusses the technique and indications for the use of the radium applicator and reports a number of cases successfully treated in children and adults. This article, although serving an excellent purpose, adds nothing original to a subject already exhaustively discussed in the literature.

Scal<sup>25</sup> points out that irradiation therapy is not a treatment for deafness but for the elimination of conditions which may produce deafness. He has employed irradiation therapy with gratifying results in over 50 patients, most of whom had impaired hearing, repeated attacks of nasal colds and infected ears. He has also used this method in a group of children with allergic bronchitis and asthma, but the results in this



group thus far have not been too encouraging. The method of application of radiation therapy is described and several typical cases are reported.

Collins and co-workers<sup>26</sup> observed considerable symptomatic improvement in 41 children followed from 18 months to two years after cessation of treatment by radon applications to the nasopharynx. They believe that to avoid overtreatment results should be judged symptomatically rather than by regression of lymphoid tissue. They consider the results of radon therapy to be superior to any obtained by use of antral lavage, nasal drops, vitamin therapy or any other form of treatment. No harmful effects were noted.

They advocate radon application for chronic conduction deafness of Eustachian origin and chronic nasal catarrh. Before irradiation is considered, they point out that the tonsils and adenoids should be removed when deemed necessary. They list among the chief dangers of irradiation: 1. interference with centers of ossification, 2. irradiation burns leading to scarring and occlusion of the Eustachian tubes, 3. overdosage which may leave a wide and patulous Eustachian tube which is amenable to infections of the middle ear, and 4. reduction of activity of the ciliated epithelium in the nasopharynx. They believe that these dangers can largely be avoided by use of small doses at widely spaced intervals. On the basis of the radiologic improvement in their series, they suggest that the mucosal thickening of the maxillary sinuses might be a secondary reaction to infected remnants in the nasopharynx, which are harboring pathogenic organisms and are also interfering with proper ventilation.

The use of radium, which is in general use in controlling nasopharyngeal lymphoid tissue, is discussed by Tyler,<sup>27</sup> who advocates its use in Eustachian tube obstruction due to lymphoid hyperplasia and in selected cases of postnasal discharge, recurrent rhinitis and sinusitis in children and in some cases of asthmatic bronchitis. No new information is contained in this article.



Robbins and Schulz<sup>28</sup> warn against the possible resultant dangers of the present vogue for treating hypertrophied lymphoid tissue in the nasopharynx with radium. They cite several cases of late radiaticn necrosis (sometimes not appearing for 10 to 20 years) which followed treatment of benign lesions with the same dosage as that recommended for use in the nasopharynx for hypertrophy of lymphoid tissue. In view of these dangers, they suggest as precautionary measures that the monel applicator not be employed routinely; that radiation be used cautiously in children and adults with benign lesions; that except in selected cases no more than erythema doses (determined by a given applicator) be given; and that the erythema dose can be determined, if necessary, by application to the examiner's skin.

Champion<sup>29</sup> reminds us that the nasopharynx is only part of the respiratory tract and is susceptible to infections occurring in other portions of the respiratory tract. It is abundantly supplied with lymphoid tissue which is not only susceptible to acute infections but also harbors chronic infections.

In spite of conscientious efforts at accurate removal, islands of lymphoid tissue are left *in situ*. These in time frequently become infected and hyperplasia occurs. This hyperplasia of the lymphoid tissue in time serves to obstruct the Eustachian orifice and interfere with good hearing. Surgical removal of this tissue is not always successful; for this reason radium applications to the nasopharynx are used. Champion describes the technique and indications which follow the usual pattern and claims that the beneficial effects of irradiation are due to the effect of radium on the germinal centers of the lymph nodes in which new cells are formed, the reduction of blockage in the lymphatic channels, and the resistance of irradiated cells to recurrent infections. He concludes that excellent results in the improvement of hearing have been obtained in some cases, and that occasionally irradiation will diminish the goblet and mucus glands of the mucosa of the nasopharynx, thereby diminishing the postnasal discharge.

Haggart<sup>30</sup> advises conservatism in the use of radium for irradiation of the nasopharynx. He points out that the gratifying results obtained in the treatment of deafness, chronic otitis media and infection with radium might be a temptation to employ larger doses at more frequent intervals, but this must be avoided. He believes that the use of radium should be restricted to properly selected cases and only safe dosages should be employed. He considers a safe routine the use of a 50 mg. applicator, inserted through the nose for 12 minutes to each side, not more than three or four times at two-week intervals within the year. Haggart mentions several potential dangers of nasopharyngeal irradiation which must be borne in mind when employing this procedure. The dosage employed must be right for the type of applicator used and the patient must be questioned before treatment is given to determine whether he has had radium or Roentgen-ray irradiation before.

Fisher<sup>31</sup> emphasizes the necessity of employing preventive measures in children if the number of deaf and partially deaf people in the United States is to be reduced. Such children show loss of hearing for high tones. For this reason it is necessary to test for high tones as well as lower tones if impaired hearing due to partial and intermittent obstruction of the Eustachian tube is to be detected early enough to institute preventive measures. In well selected cases irradiation therapy will produce diminution in size and a "smoothing out" of the nasopharyngeal lymphoid tissue which partially or completely obstructs the Eustachian tube orifices. During a two-year period 821 patients were examined in the "Better Hearing Clinic" at the Medical College of Alabama, 224 of whom showed loss of hearing due to Eustachian tube obstruction. Of 181 in whom irradiation therapy had been completed, hearing returned to normal in 93.

Thrift<sup>32</sup> discusses the introduction and development of radium therapy for lymphoid hyperplasia of the nasopharynx and gives a detailed description of the instrument used and the method of application. He has treated 65 cases, in 32 of whom treatment has been completed. Objectively, 80 to 85

per cent were improved and subjectively, 70 to 75 per cent. He noted a slow response in children, which he believes was due to selection of cases with too much tissue in the nasopharynx. He believes that in the presence of a large amount of tissue adenoidectomy should precede the use of the radium applicator. All the children in his series showed improvement. There were no complications in his cases.

Cutler and associates<sup>33</sup> present an analysis of 50 patients, including both adults and children, with nonmalignant lesions of the nasopharynx treated by irradiation according to the method of Crowe and followed for one year. From their study they observed that irradiation combined with other forms of therapy was useful in children with transitory impaired hearing associated with allergic symptoms. In these patients, associated paranasal infections are invariably present. As was expected the results of treatment were disappointing in cases of fixed impaired hearing of obvious otologic cause. Cutler and co-workers believe that radiation may be valuable in mild dysfunctions of the Eustachian tube, but point out that more experience will be necessary before this can be established.

Jones<sup>34</sup> calls attention to the beneficial effects of irradiation of the nasopharynx in properly selected cases by citing the results obtained by several authors as well as by himself in cases of impairment of hearing, aerotitis, tinnitus, fullness or pressure in the middle ear, focal infections, asthma and chronic purulent otitis media. He emphasizes the importance of treatment before irreversible changes have taken place and warns against the promiscuous use of irradiation with its unpleasant effects.

This is the sixth paper by Proctor<sup>35</sup> in a series of analyses of the various phases of the problem involved in a public health approach to the prevention of deafness. The material includes all children admitted to a clinic established in Hagerstown, Md., six years ago for the prevention of deafness in children. During the first four years the average follow-up

for 687 patients was 16.4 months; 362 other patients were seen only once; 181 had been followed more than two years and 59 more than three years.

Analysis of this material revealed the following facts: 1. in four of every five children with impaired hearing the difficulty was traceable to respiratory or aural infection, 2. in many patients even if impairment had occurred it was reversible, 3. in 1,542 ears of 774 patients normal hearing was noted in 23 per cent of the ears when first seen and 49 per cent when last seen, 4. over a five-year period there was a definite decrease in the number of patients with moderate to severe hearing impairment and chronic aural or sinus infection with each succeeding year.

Proctor believes that irradiation therapy should be confined to those with hearing impairment due to lymphoid tissue obstructing the tubal orifices, those with recurring acute respiratory or aural infections originating in infected adenoid tissue, and some patients with bronchial asthma on a basis of bacterial allergy. In regard to the possibility of a carcinogenic effect, Proctor points out that many thousands of patients have been treated and no evidence of such an effect has yet been found in his patients. Most radiologists believe that there is no basis for such a fear.

At the seventieth annual meeting of the American Laryngological Association, Morrison<sup>36</sup> demonstrated a flexible applicator for the application of radium to the lateral pharyngeal areas when introduced through the nose. It has the advantage of being able to reach a larger area by direct application. He lists the indications for this method as "recurring aerotitis, recurring acute catarrhal otitis, prevention of secondary bacterial infection and chronic suppurative otitis media, and for the reduction of hypertrophied lateral bands following tonsillectomy" and the contraindications as "nerve deafness, otosclerosis, atrophic rhinitis and pharyngitis, congenital bursae, recent acute infection and large masses of adenoids." He calls attention to the dangers to the operator as well as the patient. The dangers to the patient may arise from overdosage and the possibility of late atrophy.

After a brief discussion of the rationale, technique, purposes, contraindications, abuses and dangers of the nasopharyngeal use of the standard monel radium applicator, Morrison<sup>37</sup> describes a new type of flexible radium applicator. It is about the same size as the standard rigid applicator except that the cannula has a little greater diameter. One advantage this applicator has over the standard one is that it enables the operator to reach any lymphoid tissue in the nasopharynx without causing the radium capsule to open. In addition, it permits, for the first time, accurate and comfortable irradiation of the lateral pharyngeal bands and pharyngeal follicles. After the floor of the nose and side of the pharynx are slightly anesthetized, the applicator with its stylet is passed into the nasopharynx through the nose, with the indicating ring turned down. Withdrawal of the stylet completely out of the flexible part permits this part to turn through a right angle so that the radium capsule is in close contact with the lateral band throughout most of its length.

Dow<sup>38</sup> briefly discusses the anatomic, pathologic and physical principles involved in the use of radium for hypertrophic lymphoid tissue in the nasopharynx. The indications for this method of treatment are enumerated and the technique is described. The results obtained in 74 patients treated with radium at the Gill Memorial Eye, Ear and Throat Hospital between February, 1947, and February, 1948, are given. For comparative purposes the series was divided into two groups: 1. 41 patients in whom the monel metal 50 mg. radium sulphate applicator was placed 8.5 minutes to each side of the nasopharynx, and 2. 33 patients in whom the same applicator was placed 12 minutes to each side of the nasopharynx. The results indicate that the longer treatment removed lymphoid tissue safely and more effectively.

Spain and Weymuller<sup>39</sup> discuss the value of irradiation of the nasopharynx in the treatment of bronchial asthma in children between one and 15 years of age. They have treated 73 children with bronchial asthma in this way. Of the 43 on whom full data were available, about one-fourth obtained no benefit and about three-fourths were partially or completely

relieved of asthmatic symptoms. They point out that asthmatic children with hypertrophied and infected lymphoid tissue are generally sensitive to one or more airborne excitants or foods and this infected tissue seems to act as a focus when bacteria complicate bronchial asthma of allergic origin. It is in these cases that irradiation has proved of benefit. They conclude that "in experienced hands and in selected cases irradiation therapy offers a safe and effective means of combatting infective asthma in childhood."

Fabricant<sup>40</sup> briefly reviews the development by Crowe and associates of the concept that conduction deafness is due to hypertrophy of lymphoid tissue in and around the pharyngeal orifice of the Eustachian tube and its treatment by irradiation; however, he quotes several authorities who are of the opinion that irradiation of hyperplastic lymphoid tissue of the nasopharynx may do more harm than good unless cases are properly selected. Selection of cases for this type of treatment should be based on pathologic findings rather than symptoms. One of the real dangers of irradiation is the possibility of producing radiation damage of tissue, particularly years later. Fabricant cites a study of nasopharyngeal lymphoid tissue and hearing made by Gill on several hundred children. Of 259 children with good hearing not treated and observed for an average of six and one-half years there was a slight gain in hearing acuity for low tones and slight loss for high tones. In a group of children with impaired hearing for high tones only and treated by irradiation of nasopharyngeal lymphoid tissue there was an average gain for low tones similar to the other group and slight additional loss for high tones.

Swanberg<sup>41</sup> reminds us that since 1924 Crowe and associates have been using radon and radium in the nasopharynx to diminish hyperplastic lymphoid tissue. Lymphoid tissue has been proved to be radiosensitive and, therefore, is easily destroyed. Burnam and Crowe devised the original monel metal radium applicator which is now so widely used throughout the country. Swanberg presents his modification of the Burnam-Crowe applicator and claims as new features that: 1. the applicator is slenderer; 2. the handle of the applicator

is longer and graduated in centimeters; 3. the radium capsule has a thread hole, can be quickly unscrewed from the introducing handle and is available for usage other than in the nasopharynx; and 4. there is a dummy applicator for demonstration to the patient. The technique and indications for application of the radium are essentially the same as outlined in all articles on this subject. Swanberg's conclusions are the same as those of Crowe and associates. Except for the presentation of slight changes of questionable merit in the applicator, this entire article represents quotations from Crowe and associates.

In an interesting article containing valuable observations, Bernier<sup>42</sup> discusses the effects of the detonation of the atomic bomb in Japan in 1945. He describes the physical aspects of the bomb burst and roughly divides the casualties into several categories. This paper, however, deals chiefly with those who succumbed to the effects of ionizing radiation. Although considerable observations were made on casualties from lethal doses of ionizing radiation, little information is available on the changes which occurred in the oral regions in this group. According to Beck and Meissner, the terminal picture was that of extreme exhaustion, with blood oozing from mouth and anus, petechial hemorrhages and internal hemorrhages demonstrable only at necropsy. A second group of patients exhibited no changes until between the seventh and thirtieth day after the explosion. The majority of these had received lethal doses of gamma radiation. In these victims hemorrhagic gingivitis usually associated with tonsillitis, pharyngitis and laryngitis developed. In the more severely affected in this group, the lesions, particularly those of the trachea and female genitals, showed severely necrotic ulcerations. The picture was essentially as in agranulocytic angina.

In the third group a less severe form of radiation injury occurred. These patients showed early epilation with pharyngeal angina, which in the majority of cases did not appear until the third or fifth week after bombing. In general the inflammatory changes in the mouth, gingiva and throat were much less severe and reached a climax during the fourth week.



Bernier also discusses the changes in the blood and describes accurately with illustrations the histopathologic changes in the tissue. Sections from the tonsils showed extensive necrosis of epithelium.

#### SURGERY.

Portmann<sup>43</sup> suggests a translaryngeal approach for operations at the base of the tongue. The various steps in the operation are described and illustrated. Portmann states that the advantages of this approach are the security it offers, the opportunity of observing for a long time the development of the lingual cicatrization and the opportunity of placing tubes of radium, when necessary.

#### TRAUMA.

Shy and Carmichael<sup>44</sup> report a case of persistent rhythmic contractions of the ipsilateral pharynx, larynx, vocal cord, face and arm in a patient following attempted suicide by projection of an ordinary lead pencil into the skull via the right orbit. A detailed description of the findings on physical examination is given.

#### BURSA.

Adair<sup>45</sup> describes two cases of pharyngeal bursa associated with cleft palate. He states that only one other similar case has been reported in the literature. His first case was in a boy, 18 months old, in whom the bursa was discovered during an operation for repair of a postalveolar cleft. The second was discovered during examination of a man for a cleft palate.

#### FOREIGN BODY.

King<sup>46</sup> reports the case of a man, aged 26 years, with a history of recurrent attacks of swelling in the left side of the neck associated with painful swallowing and some fever. Roentgenograms taken during these attacks failed to disclose any evidence of calculi or opaque foreign bodies. These epi-



sodes were treated by conservative measures without relief. Fifteen months after onset of symptoms there was still no change in the physical signs, although results of laboratory tests were within normal limits. Injections of iodized oil through the sinus opening in the left tonsillar fossa revealed a sinus tract contiguous with the left submaxillary gland and Wharton's duct. Injection of methylene blue through the same opening revealed free expulsion of the dye at the frenulum of the tongue. Because of these findings operation was undertaken. At the anterior portion of the posterior belly of the digastric muscle a pocket with a diameter of about 1 cm. was found to contain a bristle, like that of a tooth brush. This was removed and the pocket thoroughly curetted. Recovery was without incident.

King states that he has never heard of a case similar to this one and presumes that the bristle had "entered the left peritonsillar fossa and dissected laterally into the neck, setting up an inflammatory process which extended anteriorly to the submaxillary gland and duct and produced sialadenitis and a through and through sinus tract extending from the tonsillar fossa to the frenulum of the tongue."

#### STENOSIS.

Sanders<sup>47</sup> devised an artificial oropharynx which he successfully used in the surgical treatment of an extensive oropharyngeal stricture in a girl 10 years old. The child had been perfectly normal until three weeks following tonsillectomy and adenoidectomy, when scar tissue began causing difficulty in breathing and swallowing. This tissue was removed at intervals of about two weeks on a number of occasions but each time it would grow back. The child was extremely apprehensive and in poor physical condition as a result of this. Sanders realized that after he removed the scar tissue, he would have to find something that could be anchored in the pharynx to prevent the formation of more scar tissue and at the same time allow no further contraction of the existing cicatrix. Accordingly, with the assistance of a dentist, he devised an artificial oropharynx which provided a usable oro-

pharynx during the period of surgical removal and reconstruction, prevented further contraction of scar tissue and facilitated plastic repair by providing a practical base for application of the skin graft. The patient was perfectly normal at the time of this report, six years postoperatively.

Goodyear<sup>48</sup> reports a method of treating nasopharyngeal atresia which has proved satisfactory in an extremely difficult case. The patient, a man 38 years old, had had 19 previous operations on the nasopharynx for complete nasopharyngeal atresia without relief. The nasopharynx was completely closed by a scarred, hard, fibrous mass. After local injection of procaine hydrochloride a sagittal incision was made and an opening bored with a Thornwald's antrum trephine. An Ingal's gold nasofrontal sinus tube, which had been previously cut to 17 mm. and had horizontal cuts made about the tube and the sections expanded, was inserted with half of a gelatin capsule over the cut edges in order to hold the leaves together. At the time of this report, a year and a half postoperatively, the patient was completely pleased with the result. The patient was given a wire applicator with the end bent at a right angle to use to dislodge any hard particles of food which might obstruct the tube.

Dohlman and Thulin<sup>49</sup> state that pharyngeal stenosis is not an unusual condition and in its milder forms is asymptomatic. Three types are recognized: the most common palatopharyngeal, the glossopharyngeal and a rather rare type of glosso-palatinal. In the past the principal cause was syphilis, but in recent years traumatism has been by far the most prevalent cause, especially after tonsillectomy, adenoidectomy, or both. Guillotine removal of tonsils in unskilled hands is especially at fault. Treatment is surgical plus some type of dilatation, and is necessary only if the condition is symptomatic. Palatopharyngeal stenosis is best treated by placing a suture through the bridge and either attaching a lead weight to this, which divides the bridge in several weeks' time, or secondary section. Glossopharyngeal stenosis, which is more difficult to treat, requires plastic methods.

Vaughan<sup>50</sup> reports a modification of a previous technique for the correction of nasopharyngeal stenosis. It consists of passing a stiff, nearly right-angled probe through the opening behind the uvula into the nasopharynx. From the upper limit of the scar attachment, a vertical incision, 2.5 cm. in length was made on each side of the uvula. On each end of the vertical incision, horizontal incisions of about 2.5 cm. were extended laterally. On each side, about 6 mm. below the upper incision, another horizontal incision of the same length was made, thus forming an "E" on one side and a reversed "E" on the other. These four flaps were elevated and retracted after sutures were passed through their inner margins. A suture through the tip of the uvula permitted exposure of the operative field after the soft palate had been drawn forward. The raw surface on the pharyngeal wall posterior to the palate was covered by rotating the lower flap upward; the lower flap was sutured with fine silk. The upper narrow flap on each side was sutured to the raw surface along the posterior border of the mobilized soft palate. Sutures were removed on the eighth day. A dilator the size of the opening and well lubricated with vaseline was passed behind the palate by the patient every day, beginning at the end of the second week and continued for several weeks. From the time of operation the patient was able to breathe freely through the nose.

#### BENIGN TUMORS.

LeJeune and Steele<sup>51</sup> report a case of angioendothelioma of the hypopharynx which is believed to be the second to be reported in the literature. The patient, a man 45 years old, had had dysphagia for 15 years. On admission, he could swallow no solid foods, was extremely dyspneic and emaciated, and exhibited a change in the quality of his voice. Indirect laryngoscopy revealed a smooth, glistening, grayish mass, about 2.5 cm. by 4 cm. in size, nearly filling the hypopharynx. Low tracheotomy was performed on the day of admission to relieve the dyspnea and two days later an attempt was made to remove the mass but had to be abandoned when apnea developed. The tumor was completely

removed at a later date by suspension laryngoscopy, which permitted bimanual operative manipulation and excision. No other method of peroral surgical approach to the lesion would have been as successful as suspension laryngoscopy in this case.

Sambataro<sup>52</sup> reports two cases of cavernous angioma of the oral cavity and pharynx. In the first case, a man 22 years old, the growth extended throughout the entire right tonsillar cavity. The base of the tongue and entire right glossoepiglottic vallecula were extensively involved. The pyriform recess did not appear to be invaded, but the tumor seemed to have surrounded the right lateral border of the epiglottis and occupied the right false vocal cord. The entire growth was removed by four applications of the monopolar electrode. This left a flexible scar and resulted in return of the voice to normal. In the second case the growth appeared as an irregularly lobate, violet colored elevation on the right side of the undersurface of the tongue. Coagulation therapy gave good results. For this reason Sambataro advocates coagulation in the treatment of these types of lesions. Following such treatment the size of the mass is immediately reduced, and as coagulation occurs a narrow halo of whitish color forms around the area of application of the electrode. This helps the operator to know at all times exactly how far the process of coagulation has proceeded.

Bey<sup>53</sup> reports the case of a girl, 16 years old, who had a sphenoid-occipital chordoma which was unusual in that it felt bony-hard. Almost all tumors of this type previously described have been said to have a "tense jelly-like feel." The patient had had complete nasal obstruction for two and one-half years. Posterior rhinoscopy revealed a large mass attached by a wide base to the roof of the nasopharynx and completely obstructing the postnasal space. The mass looked smooth and round but felt bony-hard. Roentgenograms showed an ovoid, well limited channel in relation to the base of the skull filling the cavity of the nasopharynx; it arose from the basiocciput, basisphenoid and extended forward in relation to the anteroinferior wall of the sphenoid sinuses and

laterally almost to the foramen ovale. The diagnosis of fibroma was excluded because of the hard feel of the mass and osteoma was ruled out by the Roentgenograms. After preliminary tracheotomy the tumor was exposed by a left lateral rhinotomy and was removed. Biopsy of tissues from the tumor revealed it to be a chordoma. At the time of Bey's report, two and one-half years postoperatively, there was no sign of recurrence.

Slaughter and DePeyster<sup>54</sup> describe a syndrome produced by neurilemmomas which they believe has never been described before. They report four cases, three of which arose from the vagus and one from the hypoglossal nerve. These cases presented several points in common which Slaughter and DePeyster believe should permit a presumptive diagnosis of neurilemmona of cranial nerve origin. These features are a bulging, firm submucosal tumor in the posterolateral pharyngeal wall, causing dysphagia and later interference with the airway; pulsation of the tumor due to medial displacement of the internal carotid artery and interference with function of the involved nerve. Treatment consisted of extirpation of the mass through an external cervical approach.

Brewer<sup>55</sup> reports a case of a relatively infrequent condition—hypopharyngeal polyp. The patient, a woman aged 55 years, had complained for two years of intermittent attacks of nausea associated with the feeling of a moving lump in the throat. On two occasions a long, thick, red object was regurgitated and hung out of the mouth down to the chin. Indirect laryngoscopy revealed a small, rounded polypoid mass lying in the pyriform sinus. By direct laryngoscopy, about 1.5 cm. of the polyp was teased upward; the mass was seen to be attached by a broad base to the left side of the hypopharynx on its posterior wall. Following removal of the polyp under anesthesia the patient continues to be asymptomatic. The microscopic diagnosis was benign fibromatous polyp.

Wilkerson and Cayce<sup>56</sup> report the case of a girl 19 years old with a hemangioma of the lateral band of the pharynx and nasopharynx, which was removed but recurred in a totally

different form. A diagnosis of hemangioma was made pre-operatively. Under topical cocaine anesthesia (infiltrating around the mass was deemed undesirable because of hemorrhage) the entire mass, along with the 2 or 3 mm. of apparently normal tissue, was electrocoagulated. The patient returned three months after operation with a pedunculated mass which had three lobules in about the same location as the first tumor. The entire mass was removed, together with a pedicle, and tonsillectomy was done. There had been no recurrence two years after the last operation. Wilkerson and Cayce were able to find in the literature only two other reports of hemangioma arising from and limited to the lateral pharyngeal band.

In a letter to the editor, McFarland<sup>37</sup> adds another case of nasopharyngeal fibroma to the reports in the literature. The patient, aged 14½ years, was found on biopsy to have a highly vascular fibroma in the right nostril which was treated for two years with different sclerosing fluids without changing its size. Because of infection and exophthalmos, it was decided to remove the growth. It was about the size of a tangerine and was attached to the sphenoid body with prolongations into the ethmoidal labyrinth. Recent examination at the time of the report showed no evidence of the growth but there was still slight persisting exophthalmos.

#### MALIGNANT TUMORS.

A discussion of the surgical treatment of carcinoma of the esophagus must necessarily include lesions involving the pharynx or at least a portion of it. Wookey<sup>38</sup> points out that cancer of the esophagus is much more common in men than in women, about 80 per cent of the cases occurring in men, whereas malignant growths in the lower part of the hypopharynx, known as the retrocricoid area, are almost entirely confined to women. Early diagnosis is the exception, for the distinctive symptom of dysphagia is often late in appearing and in the hypopharyngeal cases may be entirely absent. The first difficulty noted is usually eating solid foods. Hoarseness due to paralysis of a vocal cord and persistent pain in the

chest and back are considered serious symptoms, indicating that the growth has penetrated the wall of the esophagus. Wookey urges that a patient who complains of discomfort in swallowing be subjected to a careful thorough examination of the pharynx and esophagus.

Surgical operations devised for the removal of malignant growths in the hypopharynx and mouth of the esophagus should include methods of reconstruction. Lesions of the hypopharynx usually involve the posterior portion of the larynx and in reality are extrinsic carcinomas of the larynx and the larynx must be extirpated.

A complete and detailed description of the surgical procedure used by Wookey is presented. This is an excellent article for those who are interested in this type of major surgical procedure.

From a review of some of the cases of chronic tubal obstruction encountered at the otologic clinic, Perlman<sup>59</sup> concluded that the clinical diagnosis of this condition is based upon a variety of clinical pictures and nasopharyngeal findings as well as of secondary anatomic and functional changes commonly considered as resulting from tubal obstruction. He discusses some of the numerous examinations and tests which have been carried out in an effort to help remove the ambiguity of this condition and gives some clinical impressions obtained from his study. He points out that one of the most clear-cut clinical pictures of chronic tubal obstruction in which therapy can be assessed is in carcinoma of the nasopharynx. Unilateral invasion and occlusion of the tube is often an early complication in these cases. It is true that nasopharyngeal carcinoma is a rare cause of tubal obstruction, but it helps to show that any tissue of the normal tube may cause obstruction, especially in adults. In children lymphoid tissue is the most likely element causing obstruction, but other etiologic factors include inflammation and allergic changes in the mass of secretory glands within the tubes, as well as the fact that transient increases in the size of the lymphoid tissue itself and the glandular element occur with inflammation and allergic reaction and perhaps in response to endocrine stimulation.



Piccione and Foldes<sup>60</sup> discuss the symptoms and diagnosis of lymphoepithelioma and report a fatal case in a woman 42 years old. They emphasize the importance of nasopharyngeal examination in cervical adenopathy or nasal or oral symptoms and early treatment. In the case reported the patient initially noted difficulty in breathing through the nose and had a few nose bleeds. She then began to have headaches, bilateral exophthalmos, failing vision with complete blindness, pronounced nasal obstruction and dysphagia. Permission for biopsy could not be obtained, the patient's condition gradually became worse and she died about one month after admission to the hospital.

In a splendid presentation that should be read before referring patients for irradiation, Jean Tracy<sup>61</sup> describes the various techniques used by the radiologist to obtain desirable radiographs of malignancies of the upper respiratory tract. A brief survey of the anatomy of the nasopharynx, pharynx and larynx and the peculiarities of these structures is presented. The most frequent site in which the common tumors occur is discussed. There follows a discussion of tumors of the nasopharynx, postericoid region, thyroid gland, epiglottis, vocal cords, larynx and pharynx. The best method to employ is described, and the results obtained are tabulated.

In Part II of this article Annette Lee discusses in a clear and concise manner the various methods of treatment by irradiation for carcinomas of the larynx and pharynx. She states that intrinsic lesions of the larynx may be treated by the Finzi-Harmer fenestration technique using radium or by subcutaneous irradiation. Each method is described in detail with illustrations and with some additional notes on the post-therapeutic care of the patient. Good nursing and nutrition are important and proper attention should be given to patients showing severe reactions to therapy.

Diehl<sup>62</sup> adds to the literature an account of one of the rarer types of nasopharyngeal tumors, a salivary adenocarcinoma. The patient, a man 34 years old, complained chiefly of difficulty in hearing in the left ear. Examination revealed a red-



dened, fungating mass, extending from the fossa of Rosenmüller inferiorly and involving the left torus tubarius and partially occluding the left Eustachian orifice. The pathologic diagnosis following examination of a specimen obtained by biopsy was carcinoma of an aberrant salivary gland of the left portion of the nasopharynx. The mass was removed and intensive Roentgen radium irradiation was given. The patient had had no further decrease of hearing in the left ear since the original audiogram and one year postoperatively examination shows no evidence of recurrence.

In an excellent article which should be read in its entirety, Morrison and associates<sup>63</sup> present the first published report of the smear technique and cytologic studies for the diagnosis of exfoliating lesions of the nasopharynx. This study was prompted by the use of the smear technique by others for detecting cancer cells in the vaginal and bronchial secretions and by the difficulty in early diagnosis of lesions of the nasopharynx. The normal cell content of the nasopharynx was first determined and as a control the technique was applied also to visible lesions of the mouth, tonsils and larynx. The technique consists of obtaining material from the surface of the nasopharynx, after the nasal mucous membrane has been anesthetized and shrunk. This material is placed on a slide and fixed and stained by the modified method of Papanicolaou and Trout. Diagnosis is dependent upon the finding of malignant cells.

In 85 patients examined there were seven positive smears. There were no false positives and the one false negative (negative smear positive biopsy) was not an exfoliating lesion.

Attention is called to the fact that malignant cells found in the nasopharynx may have come from the nose or sinuses rather than from a lesion in the nasopharynx itself. This procedure is not advocated for routine examination. The importance of differentiating the malignant from the normal cells found in this region is stressed.

Baylin and associates<sup>64</sup> present a Roentgenologic and clinical study of 32 proved cases of nasopharyngeal malignancy, 26 of which were lymphoepitheliomas and six transitional cell carcinomas. Most of these patients sought medical aid because of sinus trouble, aural infection or similar conditions. The lesion is manifested clinically in a variety of ways; neurologic, lymphatic, nasal, ocular and auditory complaints were noted in their patients.

Baylin and co-workers stress the importance of Roentgenographic studies in these cases. Not only lateral views but also special projections, including basal or axial views, stereoscopic studies and accessory views should be made. Of their 32 patients, 25 showed, on careful Roentgenologic study, an abnormality of the nasopharyngeal airway seen either on the lateral skull film or on the mentovertebral study. Osseous changes in the skull occurred with such regularity that they are considered almost diagnostic by Baylin and co-workers. Both the primary lesion and the sites of extension and metastases are amenable to irradiation.

In a short but excellent article Munro Black<sup>65</sup> discusses tumors arising in the nasopharynx and enumerates the symptoms produced by them. If the nasopharyngeal tumor is malignant, it may extend and not only infiltrate the surrounding structures at the base of the skull but also interfere with their functions. Further extension of the malignant mass is indicated by gradual involvement of the nerves with resultant palsies of their supplied muscles and by referred pain. Adenoid hypertrophy, nasopharyngeal polypi and fibromas are discussed. The latter type of tumor is admittedly a hazardous type of tumor to attempt to excise. Better results are obtained by interstitial irradiation and multiple recurring diathermy punctures. All varieties of malignant neoplasms may occur in the nasopharynx and 32 per cent of these cases produce cervical adenopathy, 30 per cent nasopharyngeal obstruction, 23 per cent otitic symptoms and 15 per cent neurologic troubles according to Munro Black. The early diagnosis is at times difficult because of the obscurity of the lesion. Biopsy should always be performed as a guide to prognosis and to treat-

ment. Deep Roentgen-ray therapy is the only method that offers a ray of hope; according to Munro Black the five-year survival rate is only 20 per cent in malignant cases. Patients with neurologic symptoms have only a 10 per cent rate of cure and the most radiosensitive lesions reach a survival rate of 40 per cent. It has been my observation that radiosensitive tumors of the nasopharynx give a much higher survival rate than that reported in this article.

Simmons and Ariel<sup>66</sup> present an analysis of 150 consecutive cases of nasopharyngeal cancer in patients treated at the Veterans Administration Hospital, Hines, Ill. They give a brief discussion of the anatomy, emphasizing the lymphatics. Because of the select group in this series, the age, sex and racial incidences are of little value. They found no relation between syphilis, smoking or alcoholic intake and the production of nasopharyngeal cancer.

The gross pathologic condition varied from a small bulge in the nasopharynx to large fungating lesions filling the whole nasopharynx. The most frequent location of the lesions was in Rosenmüller's fossa. In this series epidermoid carcinoma comprised 34.7 per cent, transitional cell carcinoma 30.7 per cent, anaplastic carcinoma 9.3 per cent and the remainder were unclassified. One or more cranial nerves were involved on admission in 29 per cent of the cases. The abducens was most frequently involved, followed by the hypoglossal and the trigeminal.

Eighty-six per cent of the patients had cervical metastases; the upper deep cervical lymph nodes were most frequently involved.

The commonest symptom was swelling of the neck; pain over the distribution of the second division of the Vth nerve was second, and symptoms due to obstruction of the Eustachian tube were third. Gradenigo's syndrome, Trotter's triad and the jugular foramen syndrome were all observed.

Early diagnosis is difficult because there are no early manifestations, and the area involved is extremely inaccessible.

Diagnosis depends upon careful examination of the nasopharynx and biopsy of any suspicious area. Any patient with cervical metastasis in whom no primary lesion has been found should have a careful examination of the nasopharynx. The diagnosis is usually not made by the referring physician and many patients had had surgical treatment without the diagnosis having been made. Roentgenograms were not beneficial in making the diagnosis in this series.

The treatment of nasopharyngeal cancer is exclusively by means of irradiation. The methods and dosage used are described in detail. In 78 determinates, in all of which Roentgen-ray therapy was employed, the five-year survival rate was 9.8 per cent. No cures were obtained in patients with intracranial extension.

Baclesse<sup>67</sup> warns that the prognosis for cancer of the hypopharynx is poor because lesions occurring in this area are usually of an ulcerating and destructive nature. Complications, such as infection, involvement of the cartilages of the larynx and extension add to the difficulty of obtaining cures.

Baclesse divides the hypopharynx into upper and lower divisions and describes each. He attaches much importance to this division, as those lesions occurring in the upper division are more often fungating and bulky, whereas those in the lower division are more often ulcerative and destructive. Among patients at the Curie Foundation, those surviving five years were the ones with lesions in the upper division of the hypopharynx.

Laryngoscopic examination is necessary to determine the origin of the lesion. Radiologic signs of cancer arising in the upper and lower divisions of the hypopharynx are enumerated. Experience has shown that cancer of the lower division of the hypopharynx occurs with greater frequency than in the upper division. Lymph node metastasis increases the gravity of the existing condition and, although such nodes responded to therapy with clinical disappearance in 50 cases out of 186 for a period of six months to one year or more, there was eventually local recurrence.

Baclesse discusses in a thorough manner the technique for administration of radiotherapy employed at the Curie Foundation. Few articles have been published on cancer of the hypopharynx, and fewer still contain anything new. Baclesse suggests proper classification as to location of the lesion and Roentgenologic diagnosis as to location. He further shows that prognosis is good in one and bad in the other. This is a splendid article well worth reading.

Rosenberger<sup>68</sup> gives a brief but excellent discussion of tumors of the nasopharynx. He discusses the juvenile type of fibroma, which is not malignant but can cause serious complications by its erosive qualities. Treatment of this tumor is difficult but surgical removal preceded by radiation is often indicated. It may be necessary to split the palate to gain access to the tumor.

Nasopharyngeal malignancy as a result of a wide diversity of tissue types is discussed. Many types of malignancies are found in the nasopharynx. Thorough examination of the nasopharynx is stressed and the fact is pointed out that in 50 per cent of cases the first symptom is cervical metastasis, usually appearing just below the mastoid tip. Nasal obstruction, rhinorrhea, sometimes sanguineous, and symptoms of Eustachian tube obstruction are important complaints.

The results of treatment are not good. Surgical measures are usually impossible and the treatment of choice is irradiation. Rosenberger says that Hayes Martin, of Memorial Hospital, reported 25 per cent five-year cures of all types of cases.

Boyce and Bolker<sup>69</sup> point out that, although ocular manifestations of nasopharyngeal tumors are common, only two reports on this subject have appeared in the literature. For this reason they considered it worthwhile to present the results of a survey of 44 cases of nasopharyngeal tumors encountered during the past 15 years at University Hospital in Iowa City. The age and sex distributions and the incidence of types of tumors were similar to those generally reported. Thirty-two per cent of the patients in their series had one or more ocular manifestations at some time during the course of

the disease. Most of these were found to have malignant tumors. Multiple ocular manifestations were present in 64 per cent of their patients. Abducens palsy was the commonest ocular complaint, whereas oculomotor and trochlear nerve paralyses were noted in fewer cases; four patients had unilateral proptosis. Three typical cases of nasopharyngeal tumors with ocular manifestations are cited. Boyce and Bolker state that the ophthalmologist should be aware of nasopharyngeal tumors since they frequently see these patients first and consequently have an opportunity to discover the lesion early when prompt treatment would be more beneficial.

An editorial<sup>70</sup> by Hollender and Fabricant deplores the failure to recognize nasopharyngeal malignancy until metastatic involvement has taken place. Late recognition is attributed to failure to suspect a lesion in an obscure area, such as the nasopharynx, and to the relative inaccessibility of this area for routine inspection by a nonspecialist. The diagnostic value of Roentgenograms and certain neurologic symptoms, such as headache, pain, diplopia and paralysis of cranial nerves, is emphasized. Roentgen-ray therapy is considered more effective than surgical therapy once metastasis has occurred. Even with such treatment the prognosis is not particularly encouraging.

Grotts<sup>71</sup> reports a case of transitional cell carcinoma of the nasopharynx in a child 29 months old. In addition to the rarity of such tumors, Grotts points out that their occurrence is unusual in the age group between birth and five years. On admission the patient had high fever, was dehydrated and had nasal obstruction. Parenteral antibiotic therapy brought the temperature down to normal, but the nasal obstruction persisted. Manual examination disclosed a mass on the left side of the nasopharynx about the size of a cherry. No pus could be obtained from multiple incisions. Biopsy revealed the tumor to be a transitional cell carcinoma of the pharynx. Deep Roentgen-ray treatment was given, but the patient died 10 weeks after onset of symptoms.

Hung<sup>72</sup> reports a case of carcinosarcoma in a man 28 years old. The patient complained of a sensation of a lump in the throat and slight dysphagia, but no severe symptoms. Pressure down the base of the tongue revealed a globular growth rising from the lobe, leaning toward the left side behind the epiglottis. Laryngoscopy disclosed an egg-sized, elliptic, knobby, coarse tumor closing the hypopharynx and the entrance into the larynx. A specimen obtained at biopsy showed a few cell nests of adenocarcinoma embedded in a stroma rich in cells. Because the neoplasm was thought to be most likely a malignant and bleeding one, the tumor was removed by the external route. Because of its large size it had to be excised in pieces. Its origin was not determined until the thirteenth postoperative day when endoscopy revealed that the tumor arose subepithelially with a narrow pedicle from the left pyriform sinus and the left lateral posterior wall of the hypopharynx. Radium irradiation perorally was begun on the eighteenth postoperative day and the patient left the hospital on the thirty-seventh postoperative day for family reasons. Hung believes that this patient may be the youngest patient with a large hypopharyngeal carcinosarcoma recorded in the literature. A discussion of the problem of carcinosarcoma, particularly those of hypopharyngeal origin, is included.

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## THE RESEARCH STUDY CLUB OF LOS ANGELES.

The Twentieth Annual Midwinter Postgraduate Clinical Convention in Ophthalmology and Otolaryngology will be held at Los Angeles, Calif., Jan. 15-26, 1951.

The guest speakers for the convention will include, for the Eye—Dr. Derrick Vail and Dr. Irving Puntenny, both of Chicago, Ill., Dr. Frederick C. Cordes, of San Francisco, Calif., and Dr. Meyer Wiener, of Coronado, Calif. In addition, the resident speakers for the Eye will be Dr. Harold F. Whalman, Dr. S. Rodman Irvine, Dr. John A. Bullis, Dr. Warren A. Wilson and Dr. Carrol L. Weeks, all of Los Angeles, Calif.

Dr. Wiener, emeritus professor of clinical ophthalmology, Washington University School of Medicine, St. Louis, Mo., will present his usual course in Surgery of the Eye. Because of the difficulty in handling a larger class for practical demonstration on animal eyes, this special course by Dr. Wiener and associates will be limited to 24 students. Applications will be accepted in the order in which they are received. This course will start Friday afternoon, Jan. 19, and continue Saturday afternoon and all day Sunday. It will consist of a short explanation of the procedure to be followed, with demonstration on animal eyes by the instructors, after which the student himself will perform under supervision. A list of required instruments will be mailed to applicants.

For the Ear, Nose and Throat the guest speakers will include Dr. Louis H. Clerf, of Philadelphia, Pa., and Dr. James H. Maxwell, of Ann Arbor, Mich. Other lectures and instruction courses will be given by Dr. Wilford H. Belknap, of Portland, on Office Procedures; Dr. J. C. Almy Harding, of San Diego, Calif., on Nutrition; Dr. Isaac H. Jones, of Los Angeles, Calif., on Vestibular Problems; Dr. Cyril Courville, of Los Angeles, Calif., on Intracranial Complications from Ear, Nose and Throat Infections; Dr. Gilbert Roy Owen and Dr. Ray Alden Carter and staff, of Los Angeles, Calif., on X-ray Problems; Dr. George S. Sharp, of Pasadena, Calif., on Tumors in Ear, Nose and Throat; Dr. Herman Semenov, of

Beverly Hills, Calif., on Sinusitis Problems; Dr. Howard P. House, of Los Angeles, Calif., on Ear Surgery; Dr. H. James Hara, of Los Angeles, Calif., on Blood Dyscrasias in Ear, Nose and Throat; Dr. Kenneth C. Brandenburg, of Long Beach, Calif., on Psychosomatic Ear, Nose and Throat; Dr. Gilbert J. Roberts, of Pomona, Calif., on Nasal Fractures.

Write for reservations at an early date to H. M. Nickerson, manager of the Elks Club, Parkview at Sixth Street, Los Angeles 5, Calif. He will endeavor to arrange suitable quarters for you in a conveniently located hotel, and will confirm the reservation by return mail.

Each applicant must be a member of his own local medical society *in order to become eligible* for attendance at the course. Send your fee to Dr. Pierre Violé, treasurer, 1930 Wilshire Boulevard, Los Angeles 5, Calif. If anything prevents your attendance, this fee will be returned to you.

The first week will be devoted to the Eye—from Monday to Saturday, Jan. 15 through Jan. 20. The Ear, Nose and Throat week will be from Friday to Friday, Jan. 19 through Jan. 26. Those of us who confine our work to only one of the specialties may complete either subject in one week.

The fee for the Clinical Course is \$75.00; the fee for the Special Course by Dr. Wiener is \$50.00.

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#### TEMPLE UNIVERSITY COURSE.

Course in Laryngology and Laryngeal Surgery to be given at Temple University School of Medicine, Nov. 6 to 17, 1950. Fee, \$250.00. Further information and application blanks sent on request. Dr. Chevalier L. Jackson, 3401 North Broad Street, Philadelphia 40, Pa.

**NEW HEARING AID FEATURES WORLD'S TINIEST  
RECEIVER—OFFERS WIDEST FREQUENCY  
RANGE, MORE OVERTONES.**

A new hearing aid, the Audivox Super 67, featuring the world's tiniest receiver, only a trifle larger in diameter than an ordinary button on a man's shirt, now offers hard-of-hearing patients a new range of higher frequency tones. No other hearing aid receiver known to Audivox hearing experts comes even close to being as tiny as the new Super 67 receiver.

Based on Bell Telephone Laboratories designs, the Audivox 67 is a product of Audivox, Inc., successor to the Western Electric Hearing Aid Division.

Its lightweight air conduction receiver, though less than a half inch in diameter, has a frequency range in excess of 7,000 cycles. This represents an increase of approximately 3,000 cycles above present hearing aid receivers.

Many physicians, accustomed to patients' objections to wearing an aid because of the conspicuousness of the receiver, will find that the reduced size of the Audivox Super 67 receiver helps overcome this psychological resistance.

The tiny size and improved performance of the receiver is made possible by the employment of a "double magnetic" technique of sound reproduction. Entirely new in hearing aid receivers, this technique represents such an advance that the remarkable reduction in size does not result in a loss of efficiency, but actually greatly increases the frequency range.

Another feature of the Audivox Super 67 is the high and low tone control which enables the patient to accentuate either end of the frequency range in order to "focus" on normal conversation, or open up the entire range for greater enjoyment of music, the theater, movies or church. Size no longer represents a problem.

The Audivox Super 67 weighs only 6 ounces complete with batteries, and measures 3.5x2.5x0.9 inches.

Designed to provide for a large variety of individual hearing requirements, the Audivox Super 67 has an operational cost of less than one cent an hour, which assures maximum economy. It is designed as an all-in-one unit with tiny "A" and "B" batteries. It can also be used with an adapter unit and separate batteries for even greater economy of operation. The Audivox Super 67 is also available with several other receivers, including a bone conduction receiver.

Depending upon the receiver used, the output of the Audivox Super 67 varies between 119 and 136 db to give more power than most hard-of-hearing persons require.

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The University of Toronto, Faculty of Medicine, announces a combined Refresher Course in Ophthalmology and Otolaryngology during the week of Jan. 29 to Feb. 3, 1951. Dr. Phillips S. Thygeson, University of California School of Medicine, and Dr. Charles Iliff, Johns Hopkins University, will be guest speakers in Ophthalmology. Dr. LeRoy Schall, Harvard University, and Dr. G. E. Tremble, McGill University, will be guest speakers in Otolaryngology. There will be surgical and medical clinics in these two subjects in addition to lectures by members of the faculty.

The course will be given for a minimum of 10 students and a maximum of 25 students. Application may be made to the Dean of the Faculty of Medicine not later than Nov. 30, 1950.

OCTOBER 1, 1950

**HEARING AIDS ACCEPTED BY THE COUNCIL ON  
PHYSICAL MEDICINE OF THE  
AMERICAN MEDICAL ASSOCIATION.**

**As of April 1, 1950.**

**Aurex Model F and Model H.**

**Manufacturer:** Aurex Corp., 1117 N. Franklin St., Chicago, Ill.

**Beltone Mono-Pac; Beltone Harmony Mono-Pac; Beltone Symphonette; Beltone Mono-Pac Model M.**

**Manufacturer:** Beltone Hearing Aid Co., 1450 W. 19th St., Chicago, Ill.

**Clearitone Model 500; Clearitone Regency Model.**

**Manufacturer:** American Sound Products, Inc., 2454 S. Michigan Ave., Chicago 16, Ill.

**Dysonic Model 1.**

**Manufacturer:** Dynamic Hearing Aids, 43 Exchange Pl., New York 5, N. Y.

**Electroear Model C.**

**Manufacturer:** American Earphone Co., Inc., 10 East 43rd St., New York 17, N. Y.

**Gem Hearing Aid Model V-35; Gem Model V-60.**

**Manufacturer:** Gem Ear Phone Co., Inc., 50 W. 29th St., New York 1, N. Y.

**Maico Atomeer; Maico UE-Atomeer; Maico Quiet Ear Models G and H.**

**Manufacturer:** Maico Co., Inc., North Third St., Minneapolis, Minn.

**Mears Aurophone Model 200; 1947—Mears Aurophone Model 98.**

**Manufacturer:** Mears Radio Hearing Device Corp., 1 W. 34th St., New York, N. Y.

**Micronic Model 101 (Magnetic Receiver); Micronic Model 303.  
(See Silver Micronic.)**

**Manufacturer:** Micronic Co., 727 Atlantic Ave., Boston 11, Mass.

**Microtone T-3 Audiomatic; Microtone T-4 Audiomatic; Microtone T-5 Audiomatic; Microtone Classic Model T9; Microtone Model 45.**

**Manufacturer:** Microtone Co., 4602 Nicollet Ave., Minneapolis 9, Minn.

**National Cub Model C; National Standard Model T; National Star Model S; National Ultrathin Model 504; National Vanity Model 506.**

**Manufacturer:** National Hearing Aid Laboratories, 815 S. Hill St., Los Angeles 14, Calif.

**Otarion Model E-1; Otarion Model E-1S; Otarion Model E-2; Otarion Model E-4; Otarion Models F-1 and F-2.**

**Manufacturer:** Otarion Hearing Aids, 159 N. Dearborn St., Chicago, Ill.

**Paravox Models VH and VL (Standard); Paravox Model XT (Xtra-Thin); Paravox Model XTS (Xtra-Thin); Paravox Model Y (YC and YC-7) (Veri-Small).**

**Manufacturer:** Paravox, Inc., 2056 E. 4th St., Cleveland, Ohio.

**Radioear Permo-Magnetic Multipower; Radioear Permo-Magnetic Uniphone; Radio Ear All Magnetic Model 55; Radioear Model 62 Starlet.**

**Manufacturer:** E. A. Myers & Sons, 306 Beverly Rd., Mt. Lebanon, Pittsburgh, Pa.

**Silver Micronic; Silver Micronic (Magnetic and Crystal) Models 202M and 202C. (See Micronic.)**

**Manufacturer:** Micronic Corp., 101 Tremont St., Boston 8, Mass.

**(See Micronic.)**

**Silvertone Model 103BM; Model M-35; Model P-15.**

**Manufacturer:** National Hearing Aid Laboratories, 815 S. Hill St., Los Angeles 14, Calif.

**Distributor:** Sears-Roebuck & Co., Chicago, Ill.

**Solo-Pak Model 99.**

**Manufacturer:** Solo-Pak Electronics Corp., Linden St., Reading, Mass.

**Sonotone Model 600; Sonotone Model 700; Sonotone Model 900; Sonotone Models 910 and 920; Sonotone Model 925.**

**Manufacturer:** Sonotone Corp., Elmsford, N. Y.

**Superfonic Hearing Aid.**

**Manufacturer:** American Sound Products, Inc., 2454 S. Michigan Ave., Chicago, Ill.



**Televox Model E.**

Manufacturer: Televox Mfg. Co., 117 S. Broad St., Philadelphia 7, Pa.

**Telex Model 22; Telex Model 97; Telex Model 99; Telex Model 200; Telex Model 1700.**

Manufacturer: Telex, Inc., Minneapolis 1, Minn.

**Tonemaster Model Royal.**

Manufacturer: Tonemasters, Inc., 1627 Pacific Ave., Dallas 1, Tex.

**Trimm Vacuum Tube No. 300.**

Manufacturer: Trimm, Inc., 400 W. Lake St., Libertyville, Ill.

**Unex Model "A"; Unex Midget Model 95; Unex Midget Model 110.**

Manufacturer: Nichols & Clark, Hathorne, Mass.

**Vacolite Model J.**

Manufacturer: Vacolite Co., 3003 N. Henderson St., Dallas 6, Tex.

**Western Electric Model 63; Western Electric Model 64; Western Electric Models 65 and 66.**

Manufacturer: Western Electric Co., Inc., 120 Broadway, New York 5, N. Y.

**Zenith Model 75; Zenith Miniature 75.**

Manufacturer: Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

All of the accepted hearing devices employ vacuum tubes.

Accepted Hearing Aids more than five years old have been omitted from this list for brevity.

**TABLE HEARING AIDS.**

**Aurex (Semi-Portable)—*Jour. A. M. A.*, 109:585 (Aug. 21), 1937.**

Manufacturer: Aurex Corp., 1117 N. Franklin St., Chicago (10), Ill.

**Precision Table Hearing Aid—*Jour. A. M. A.*, 139:785-786 (Mar. 19), 1949.**

Manufacturer: Precision Electronics Co., 850 West Oakdale Ave., Chicago 14, Ill.

**Sonotone Professional Table Set Model 50—*Jour. A. M. A.*, 141:658 (Nov. 15), 1949.**

Manufacturer: Sonotone Corp., Elmsford, N. Y.

All of the Accepted hearing devices employ vacuum tubes.

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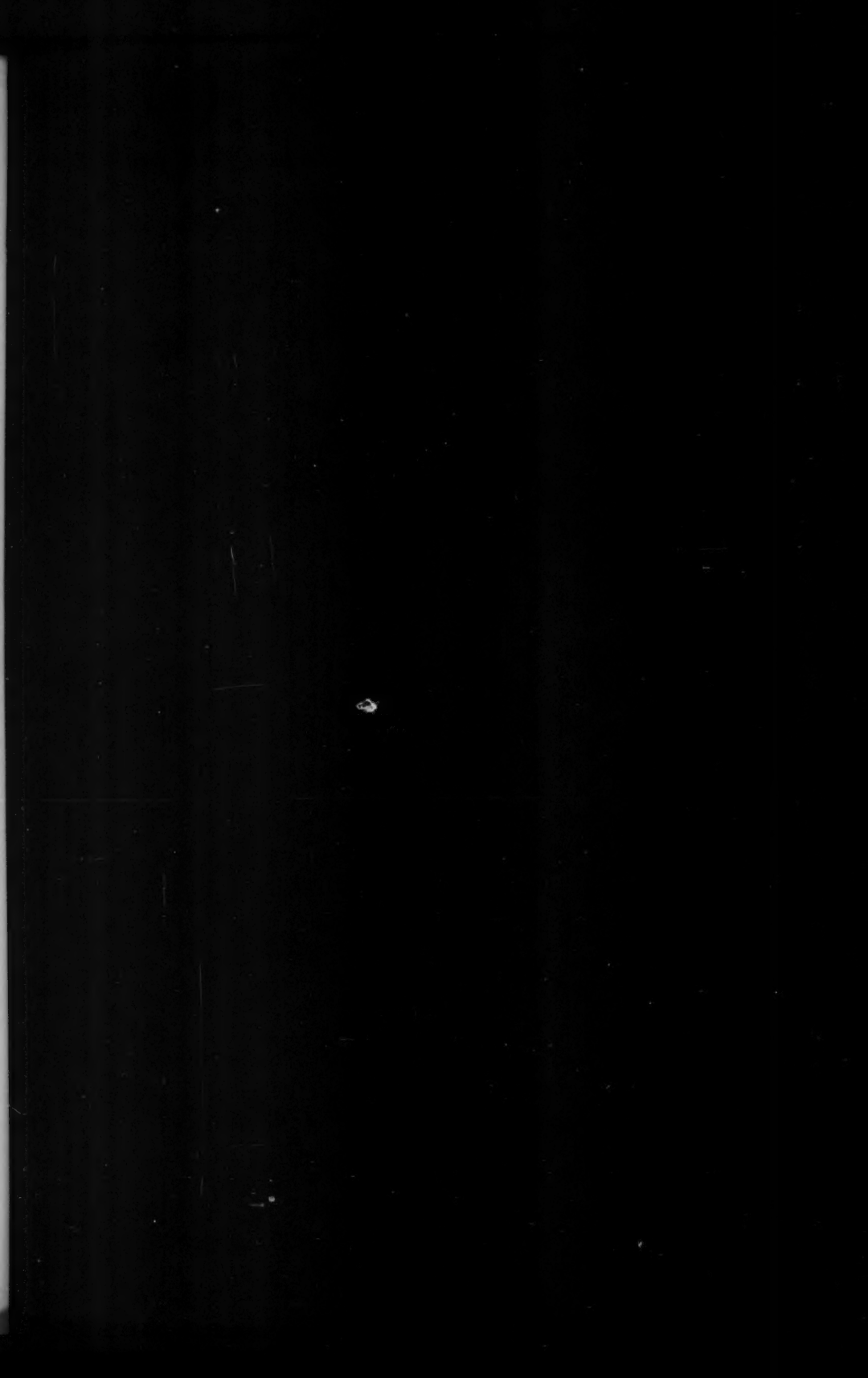
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